PRF-AMSTI-S018
9 August 2000

Warning

STRICOM is providing this draft specification for the MILES 2000 follow-on procurement for information only. STRICOM plans to procure the follow-on MILES 2000 systems under the STRICOM Omnibus IDIQ Contract.

PERFORMANCE SPECIFICATION

FOLLOW-ON

FOR THE

MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES) 2000 TRAINING SYSTEM

PREPARED BY
SIMULATION, TRAINING AND INSTRUMENTATION COMMAND (STRICOM)
12350 Research Parkway
Orlando, Florida 32826-3276

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1 SCOPE

1.1 IDENTIFICATION

This Specification defines the performance requirements of the MILES 2000 Training System. The MILES 2000 requirement is for the replacement of existing U.S. Army direct-fire ground-based MILES devices ("Basic MILES") with a laser-based Tactical Engagement Simulation (TES) training devices. All MILES 2000 systems and devices will be downwardly operational compatible with Basic MILES and fielded MILES 2000 training devices.

1.2 BACKGROUND

The family of Basic MILES devices was developed in the early 1980's using technology and designs then available. The Army has identified the need for enhanced force-on-force simulation of armor and anti-armor devices. Enhancement features include Player Identification (PID), fratricide identification, multiple levels of kill, and vulnerability due to direction of attack. New weapons, ammunition, and weapon performance will be accommodated.

2 APPLICABLE DOCUMENTS

2.1 GENERAL

The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 GOVERNMENT DOCUMENTS

2.2.1 SPECIFICATIONS, STANDARDS AND HANDBOOKS

The following specifications, standards, and handbooks, of the exact issue shown in the Document Summary List (DSL), form a part of this specification to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-129 Marking for Shipment and Storage (Part 1 of 4 Parts)

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-171	Finishing of Material and Wood Surfaces
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-461	Requirements for Control of Electromagnetic Interference Emission and Susceptibility
MIL-STD-462	Electromagnetic Interference Characteristics; Measurement of
MIL-STD-471	Maintainability Verification/Demonstration/Evaluation
MIL-STD-781	Reliability Testing for Engineering Development, Qualification and Production
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-1275	Characteristics of 28 Volts DC Electrical Systems in Military Vehicles
MIL-STD-1425	Safety Design Requirements for Military Lasers and Associated Support Equipment
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-STD 1474	Noise Limits for Military Material (Matrix)

2.2.2 OTHER GOVERNMENT DOCUMENTS, DRAWINGS AND PUBLICATIONS

The following other Government documents, drawings, and publications, of the exact issue shown in the DSL, form a part of this specification to the extent specified herein.

(Unless otherwise specified, copies of federal and military specifications, standards, and handbooks are available through the DOD Single Stock Point: Standardization Document Order Desk, Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094)

PMT 90-S002F	MILES Communication Code (MCC97) Standard

(Unless otherwise specified, copies of Government documents, drawings, and publications are available through the Naval Air Warfare Center Training Systems Division, Code 27322, 12350 Research Parkway, Orlando, FL 32826-3276.)

2.3 NON-GOVERNMENT PUBLICATIONS

The following documents of the issue revision shown on the DSL form a part of this Specification to the extent specified herein.

ANSI Z136.1-93	Standard for the Safe Use of Lasers
ANSI/NEMA Z535.3-91	Criteria for Safety Symbols
ANSI/NEMA Z535.4-91	Product Safety Sign and Labels

(Applications for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

2.4 ORDER OF PRECEDENCE

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supercedes applicable laws and regulations unless a specific exemption has been obtained.

3 REQUIREMENTS

3.1 MILES 2000 TRAINING SYSTEM DEFINITION

The MILES 2000 Training System shall:

a. Consist of a family of laser based training devices appended to foot soldiers, crew served ground weapons, ground vehicle weapon systems, and targets such as High Mobility Multipurpose Wheeled Vehicle (HMMWV), trucks, bunkers, and bridges.

b. Simulate each herein specified weapon and ammunition effect on a MILES 2000 equipped system.

c. Interface and be compatible with all BASIC MILES and fielded MILES 2000 Training Devices, including Air-To-Ground Engagement System (AGES) AD, AGES II, Mobile Independent Target System (MITS) and Laser Target Interface Device (LTID).

d. As the result of a weapon trigger pull in an engagement, transmit messages that contain a unique PID code and the weapon and ammunition code in accordance with (IAW) PMT 90-S002F.

e. Assess the lethality effects of the engagement on the MILES 2000 system engaged.

f. Trigger the specified visual and audio cues.

g. Store engagement data in electronic media for retrieval and use in after action reviews (AARs).

h. Be programmable using an external programming source as specified in 3.2.1.3.

i. Provide ancillary devices to boresight lasers to weapon systems as required.

j. Provide administrative control functions

3.1.1 MILES 2000 SYSTEM PRIME ITEM DIAGRAM

The MILES 2000 Training System:

a. MILES 2000 Combat Vehicle System

b. MILES 2000 Independent Target System

c. MILES 2000 Crew Served Weapon System

d. MILES 2000 Individual Weapon System

e. MILES 2000 Surrogate Weapon System

f. After Action Review (AAR) System

g. Controller Device

h. Ancillary Devices

i. Software Engineering Environment (SEE)

3.1.2 MILES 2000 INTERFACE DEFINITION

MILES 2000 required functional relationships/interfaces are as follows:

3.1.2.1 MILES 2000 INTERFACE

Each MILES 2000 Laser Transmitter Unit and Controller Device shall interface with the MILES 2000 Laser Detector Units by way of a laser light beam communication channel through the atmosphere IAW PMT 90-S002F.

3.1.2.2 BASIC MILES INTERFACE

Each MILES 2000 device shall interface and be compatible with BASIC MILES Training Devices, including AGES AD, AGES II, MITS, and LTID by way of the specified laser

communication channel through the atmosphere IAW PMT-90-S002FF.

3.1.2.3 OPERATOR INTERFACE

Each MILES 2000 system and device shall interface with individual operators, crews, and controllers to input data and select system parameters to the MILES 2000 systems and to receive the system data from the MILES 2000 system.

3.1.2.4 DATA TRANSFER INTERFACE

Each MILES 2000 system shall provide an external data input/output (I/O) interface via an industry standard interface protocol to meet the specific timing requirements as specified in 3.4.1.7.1. The data transfer interface shall allow for the download of event data from the MILES 2000 systems**,** the upload of PID, weapon characteristics, and vulnerability data and the download of events data to a PC or laptop computer.

3.1.2.5 HOST INTERFACE

MILES 2000 systems shall interface optically, electronically, and mechanically with host vehicles systems, weapons systems, and operators IAW the following paragraphs:

3.1.2.5.1 VEHICLE INTERNAL COMMUNICATION INTERFACE

The Combat Vehicle system shall inject alert tones and aural messages into the vehicle internal communications system as specified in paragraph 3.4.1.1(i). No permanent modifications to the vehicles will be permitted.

3.1.2.5.2 VEHICLE EXTERNAL COMMUNICATION INTERFACE

The external communication of the Combat Vehicle System being assessed as a catastrophic kill or communication kill shall be interrupted until MILES system reset or resurrection. The Combat Vehicle System shall have an override to permit external communication by the crew when the external communication has been disabled. No permanent modifications to the vehicles will be permitted.

3.1.2.5.3 WEAPON SYSTEM TRIGGER INTERFACE

The Combat Vehicle System Laser Transmitter Unit shall interface and provide electronic isolation with the primary weapon trigger circuitry of the vehicles listed in 30.1 of Appendix A. For the Crew Served Weapon Systems listed in 30.3 of Appendix A that utilize the actual components of the Crew Served Weapon being simulated, their corresponding Laser Transmitter Unit shall interface with the weapon trigger circuitry. The interface shall protect the weapon trigger circuitry from current sags, surges, and transients resulting from the interface with the MILES 2000 system.

3.1.2.5.4 MECHANICAL INTERFACE

MILES 2000 systems shall be appended to vehicle systems, weapon systems, individual operators, and other structures such as bunkers, bridges, and buildings IAW this Specification.

3.1.2.6 DIRECT/INDIRECT FIRE CUE (DIFCUE) INTERFACE

The Combat Vehicle System shall interface with the DIFCUE device as specified in Specification AMSTI 93-S027. The Combat Vehicle System shall provide a signal to trigger the DIFCUE when a catastrophic kill has been assessed. The Combat Vehicle System operation, with the exception of the DIFCUE not firing, shall not be affected when the DIFCUE system is not connected.

3.1.2.7 MAIN GUN SIGNATURE SIMULATOR (MGSS) INTERFACE

The M1A1 and M1A2 MILES 2000 Combat Vehicle System shall interface with the MGSS device as specified in Specification AMSTI 93-S026. When simulating the firing of the main gun, the M1A1 and M1A2 MILES 2000 Combat Vehicle System shall transmit a signal to activate the MGSS. The Combat Vehicle System operation, with the exception of the MGSS not firing, shall not be affected when the MGSS system is not connected.

3.1.3 NOT USED

3.1.4 GOVERNMENT-FURNISHED PROPERTY

None

3.2 SYSTEM CHARACTERISTICS

The following subparagraphs describe the required MILES 2000 training system performance characteristics.

3.2.1 SYSTEM PERFORMANCE

The MILES 2000 training system shall provide force-on-force engagement simulations to obtain feedback on the effects of direct fire weapon engagement simulations on personnel, independent targets, crew served weapons, and combat vehicles. The casualty assessments shall pair attackers and their targets. The engagement results shall be indicated to the target and attacker using visual and audible cues. In addition to the above requirements, the MILES 2000 Training System shall perform as follows:

3.2.1.1 SHOOTER

The MILES 2000 Shooter shall:

a. Transmit weapon engagement data which includes armor kill code words, man kill code words, near miss code words, ammunition type, and PID which allows Probability of Kill assessments.

b. Transmit the MILES 2000 PID that allows pairing between the shooter and the target.

c. Be downward MILES compatible by:

(1) Projecting a laser beam(s) onto a target out to the effective range of each weapon and its ammunition being simulated as listed in Appendix A. The laser beam "footprint" shall convey ammunition type, PID, and the number of man and armor kill and near miss words as specified in PMT-90-S002F,

(2) Projecting a laser beam(s) to produce the near miss "footprint" onto a target for each weapon and its ammunition being simulated as listed in Appendix A. The laser beam "footprint" shall be larger than the beam specified in 3.2.1.1(1) above and shall convey ammunition type, PID, and the number of near miss words as specified in PMT-90-S002FF. The near miss mode shall not apply to missile weapons.

(3) Transmitting engagement data encoded on the laser beam for Shooter to target pairing specified in 3.2.1.2 e.(1) and 3.2.1.2 e.(2), with the pairing probabilities listed below. The aimpoint for the Laser Transmitter shall be the center of the target profile. For the purpose of the MILES 2000 training system design, the atmospheric conditions are defined as a maximum visibility of 23.5 Km, wind speed of 2.5 $\pm$2.5 Kmph, a relative humidity of 55 $\pm$15%, and the following temperatures:

(a) For a temperature of 25 $\pm$5 degrees C,

1) With the exception of the M240, M249, and M2 a minimum of 95% pairing probability out to 90% of the weapon's effective range as listed in Appendix A. A casualty assessment indication on the target is considered a pairing.

2) For the M240, M249, and M2, a minimum of 85% pairing probability with a group of three MILES 2000 targets out to 90% of the weapon's effective range as listed in Appendix A. Each engagement shall consist of the weapon being fired in burst mode consisting of six to nine shots. targets shall be placed side by side, with one meter $\pm$.1 meter between the center of each target. A casualty assessment indication on any of the targets is considered a pairing.

3) For the M240, and M2, a minimum of 85% pairing probability with a group of three MILES 2000 targets out to 90% of the weapon's suppression range as listed in Appendix A. Each engagement shall consist of the weapon being fired in burst mode consisting of six to nine shots. The targets shall be placed side by side, with one meter $\pm$.1 meter between the center of each Laser Detection System. A casualty assessment or near miss indication on any of the Laser Detection Systems is considered a pairing.

4) With the exception of the M240, and M2, a pairing probability of less than 20% with each MILES 2000 Laser Detection Unit for ranges greater than 170% of the weapon's effective range as listed in Appendix A. A casualty assessment indication on the target is considered a pairing.

5) For the M240 and M2, a pairing probability of less than 20% with each MILES 2000 target for ranges greater than 130% of the weapon's suppression range as listed in Appendix A. A casualty assessment indication on any of the targets is considered a pairing.

(b) For ~~a~~ temperatures between -18 and 20 degrees C and between 30 and 49 degrees C,

1) With the exception of the M240, M249, and M2, a minimum of 90% pairing probability with each MILES 2000 target out to 90% of the weapon's effective range as listed in Appendix A. A casualty assessment indication on the target is considered a pairing.

2) For the M240, M249, and M2, a minimum of 80% pairing probability with a group of three MILES 2000 targets out to 90% of the weapon's effective range as listed in Appendix A. Each engagement shall consist of the Laser Weapon Simulator being fired in burst mode consisting of six to nine shots. targets shall be placed side by side, with one meter $\pm$.1 meter between the center of each target. A casualty assessment indication on any of the targets is considered a pairing.

3) For the M240 and M2, a minimum of 80% pairing probability with a group of three MILES 2000 targets out to 90% of the weapon's suppression range as listed in Appendix A. Each engagement shall consist of the Laser Weapon Simulator being fired in burst mode consisting of six to nine shots. The targets shall be placed side by side, with one meter $\pm$.1 meter between the center of each target. A casualty assessment or near miss indication on any of the targets is considered a pairing.

4) With the exception of the M240 and M2, a pairing probability of less than 25% with each MILES 2000 target for ranges greater than 170% of the weapon's effective range as listed in Appendix A. A casualty assessment indication on the target is considered a pairing.

5) For the M240 and M2, a pairing probability of less than 25% with each MILES 2000 target for ranges greater than 130% of the weapon's suppression range as listed in Appendix A. A casualty assessment indication on any of the targets is considered a pairing.

(c) Transmit the Weapon Simulator laser light beam at a wavelength of 904.5 $\pm$25 nanometers.

d. Have no external power switches.

e. Include firing system delays for trigger pull time and actual firing time. The MILES 2000 system shall inhibit the firing of successive rounds until time has expired between rounds to simulate reloading the weapon and simulate the limitations imposed by the weapon's maximum rate of fire as listed in Appendix A.

f. Provide a means of aligning and boresighting the system to the weapon system within 15 minutes or less with at least a ten hour boresight retention under training exercise conditions defined in 3.2.5. The boresighting procedure for each weapon shall not include adjustments to the host weapon sight with the exception of the M1A1 M2, the M1A2, and the M2/M3 series TOW.

g. Provide a dry fire trigger unit to provide the ability to activate Shooter for pairing without firing blank ammunition.

3.2.1.2 TARGET SYSTEM

The MILES 2000 Target Systems shall:

a. Decode the following Laser Transmitter Unit messages:

(1) Weapon Type
(2) Ammo Type
(3) PID

b. Be compatible with Laser Transmitter codes fired from basic MILES and fielded MILES 2000 systems and:

(1) Detect the encoded laser beam transmitted by the MILES 2000 Laser Transmitter in ambient illumination ranging from darkness to full sunlight.

(2) Utilize detectors with maximum response centered in the 904.5 $\pm$25 nanometers range. The responsivity of the detector shall be 0.38 $\pm$.08 amps per watt for light measured at 904.5 $\pm$25 nanometers and less than 0.1 amps per watt for light at a wavelength less than 800 nanometers.

(3) Pair throughout 360 degrees of detection coverage in azimuth and $\pm$45 degrees of detection coverage in elevation off the centerline of the target.

(4) Create a statistical shot pattern that meets the requirements below:

(a) The statistical shot profile for the front, back, and sides of the Combat Vehicle System and Independent Target System shall consist of a collection of aimpoints that pair the MILES armor kill words and PID from the following Laser Weapon Simulator (man kill words for the 25mm) with the corresponding Target System within the probabilities specified

in 3.2.1.1b.(3). The profile dimensions, when measured at the midpoint of the Weapon's effective range, shall attempt to replicate the actual shape of the vehicle. As a minimum, the profile shall be larger than a circle with a diameter of one meter and shall fit inside a concentric circle with a diameter of 8.5 meters.

Laser Transmitter(s)		Laser Target System
120mm, 25mm, vehicle TOW	vs.	Combat Vehicle System
120mm, 25mm, vehicle TOW	vs.	Independent Target System
TOW	vs.	Combat Vehicle System
TOW	vs.	Independent Target System
AT4	vs.	Combat Vehicle System
AT4	vs.	Independent Target System

(b) The statistical shot profile for the front and back of the Manworn Unit and the sides of the Crew Served Weapon shall consist of a collection of aimpoints that pair the MILES man kill words and PID from the following Laser Weapon Simulator with the corresponding Target System within the probabilities specified in 3.2.1.1b. (3). This profile, when measured in the dryfire mode at the midpoint of the Weapon's effective range, shall be larger than a circle with a diameter of .2 meters and shall fit inside a rectangle measuring 1.5 meters in the horizontal plane and 2.5 meters in the vertical plane.

Laser Transmitter(s)		Target System(s)
M16A2, M24, M240, M249, M2	vs.	Manworn Unit
M16A2, M24, M240, M249, M2	vs.	Crew Served Weapon System

(5) Compensate for the atmospheric effects of air turbulence and the resulting laser beam scintillation and beam wander.

(6) Process the electronic signals to decode the MILES code messages IAW PMT-90-S002FF. After the reception of 22 missile code messages within ten seconds, the initiation of the kill/near miss determination shall not be dependent on the decoder's ten second tracking interval window.

c. Contain a programmable Probability of kill (Pk) that is a function of the single execution of the MILES kill routine, per PMT-90-S002F, for each MILES code number.

d. Process the decoded message in conjunction with a Pk factor in a MILES 2000 lethality algorithm and the target/weapon hierarchy specified in PMT-90-S002F to assess the effect of the attacking weapon on the attacked MILES 2000 system.

e. Generate the following audio and visual signals to trigger the following actions upon completion of casualty assessment effect on a target:

(1) Two flashes for Combat Vehicle System and Independent Target System's near miss indication.

(2) Two tones for Crew Served Weapon System and Manworn Unit's near miss indication.

(3) Four flashes for the Combat Vehicle System's hit, firepower kill, and communication kill indication.

(4) Four flashes for the Combat Vehicle System and Independent Target System's mobility kill indication.

(5) Continuous flashing for the Combat Vehicle System and Independent Target System's catastrophic kill indication.

(6) Continuous tones for the Crew Served Weapon System and Manworn Unit's kill indication.

f. Process the PID portion of each engagement message group for linkage with lethality assessment.

g. Provide with an internal clock containing day, month, year, and time information synchronized by the Controller Device to a 30 second accuracy in a 96 hour period. The time display format shall be XXYYZZ or XX:YY:ZZ—where XX represents hours (00-24), YY represents minutes, and ZZ represents seconds.

h. Record and store MILES 2000 events which occur during a training exercise. The event recorder shall have sufficient memory capacity for storing the data of the last 500 events. Recorded data shall be retained under low power conditions and battery removal. The event data fields to be stored shall include the following:

(1) Initiation events, to include power up.

(a) Synchronized time of event
(b) Host platform PID
(c) Host platform type (vehicle only)
(d) Weapon/ammunition type (vehicle only)
(e) Ammunition Load Count (vehicle only)
(f) Built In Test (BIT) results

(2) Firing events, Combat Vehicle (Primary Weapons Only), and Crew Served Weapon Systems.

(a) Synchronized time of event
(b) Host platform PID
(c) Weapon type
(d) Ammunition type
(e) Ammunition remaining

(3) Lethality assessment events, to include hit, mobility kill, communication kill, firepower kill, catastrophic kill, and near miss.

(a) Synchronized time of event
(b) Lethality assessment
(c) PID of attacker
(d) Weapon and ammunition type (Ammo type N/A for Near Miss and Small Arms)

(e) Aspect Angle of attack (Vehicle only)
(f) Turret position (Turreted vehicles only)
(g) Determination of fratricide by comparison of shooter and target PID

(4) Cheat Events, to include tampering attempts and motion after mobility kills as defined in 3.2.1.3(o) **,** 3.4.1.1.e.(3), and 3.4.1.2.c.(2).

(a) Synchronized time of event
(b) Cheat category description

(5) Administrative events, to include time synchronization, administrative kills, resurrect, and commanded BIT results as defined in 3.2.1.3(f), 3.2.1.3(p), 3.2.1.3(q), 3.2.1.4, and 3.4.1.1(h).

(a) Synchronized time of event
(b) Administrative category description

i. When a casualty has been assessed, during both day and night conditions, display the weapon type causing casualty and the casualty assessment. The message shall remain displayed for 7.5 $\pm$2.5 seconds.

j. Visually display, upon recall, no less than the 16 most recently recorded events. The scrolled messages shall remain displayed for 7.5 $\pm$2.5 seconds. At a minimum, the following information shall be available for display:

(1) Results of last event (Kill/hit/near-miss)

(2) PID of attacking player/weapon system when killed

(3) Low battery indication

(4) BIT failure (by type)

(5) Ammunition remaining by weapon, quantity and type, for Combat Vehicle Systems only

(6) Platform type (vehicle only) and PID

(7) Synchronized time of an event in military format to nearest second

k. Provide an interface which shall be used to manually select a vehicle type and ammunition load for the Combat Vehicle and Independent Target Systems. This action shall require controller personnel interaction and shall not be independently available to the crew.

l. Allow transfer of the stored event data specified in 3.2.1.3(h).

m. Allow download of vulnerability Pks and other data which programs the device to allow it to assume the role and performance characteristics of the system on which it will be installed. The data to be transferred shall include the following as a minimum:

(1) OPFOR PID

(2) BLUEFOR PID

(3) Basic Ammunition Default Load (All primary weapons of the Combat Vehicle System and the Crew Served Weapon System)

(4) Ammunition type (All primary weapons of the Combat Vehicle System and Crew Served Weapon System)

(5) Ammunition delay time (All primary weapons of the Combat Vehicle System and the Crew Served Weapon System)

(6) Vulnerability and Pk data

(7) Capability to prevent the host system from assessing a kill from its own encoded laser transmission.

n. Provide a low power indication.

o. Provide a means to detect player efforts to inhibit MILES 2000 system equipment performance. As a minimum, whenever the player tampers with a MILES 2000 system to interfere with normal power supply, cable connections, detectors, semi-permanent memory data storage unit, and controller's interface when it is locked to the player, the system shall detect a tamper attempt and perform a kill on the MILES 2000 system. The tamper attempt shall be stored in the event storage.

p. Return the MILES 2000 system units to a full operational state without altering the count of remaining ammunition and stop any casualty assessment indication when the Target System detects and decodes the resurrection command.

q. Return the MILES 2000 system units to a full operational state, stop any casualty assessment indication, and return ammunition loads to the default level, for Combat Vehicle Systems only, when the target system decodes the reset command from the MILES 2000 Controller Device.

r. Retain all stored information for a minimum of 96 hours, regardless of system power status.

s. Contain an event memory clear function to allow only controller personnel to clear the event memory.

t. Perform a MILES catastrophic kill at the time of system power up.

3.2.1.3 BIT CHARACTERISTICS

A built-in fault detection and locating system shall be provided to detect performance degradation and failures for all MILES systems with a 90% confidence. BIT features shall include the following:

a. Provide an assessment of overall system integrity in not more than one (1) minute upon command.

b. Diagnose problems and faults to at least the major component level (excluding vehicle mounting hardware, and transit cases).

c. All MILES 2000 systems and devices which use battery power, except for the vehicle TOW tube, shall have a method to self test the battery power level for immediate operation without the use of special tools or modification. This test shall be performed automatically upon battery insertion and shall notify the operator of the battery power status.

d. Function on-line, shall be entirely self-contained, and shall require no external measurement equipment.

e. Display the results of BIT to the MILES 2000 system operator when the system has completed an integrity checkout.

f. Power On BIT - All MILES 2000 systems shall automatically initiate a complete BIT sequence in response to powering up the system with results indicated as specified in 3.2.1.4(a) through 3.2.1.4(e).

g. Manual BIT - All MILES 2000 systems shall initiate a complete BIT sequence in response to a request from the system operator as specified in 3.2.1.4(a) through 3.2.1.4(e).

3.2.1.4 COMPUTATIONAL SYSTEM REQUIREMENTS

The MILES 2000 computational system shall consist of computer systems, system software,

and the SEE required to meet the performance requirements for all portions of this Specification.

3.2.1.4.1 OPERATIONAL COMPUTER SYSTEMS

The operational computer systems shall consist of one or more Commercial Off-The-Shelf (COTS) processors and COTS peripherals, interface hardware, controllers, and cables. Each processor shall have a word size, operating speed, installed memory, and bus bandwidth to fulfill the system requirements and spare capacity requirements of this Specification. The operational computer system(s) shall provide, at a minimum, the following spare resources to allow for expansion and modification. Spare requirements shall be met during worst-case system operating conditions where maximum demands are placed on processors, memories, and I/O channels. The required spare resources are as follows:

a. Spare memory. The system shall provide spare memory for each processor equal to 50% of the installed memory for that processor. Spare memory for any shared memory equal to 50% of the installed memory shall also be provided. All installed spare memory shall be directly addressable by the delivered processor and operating system.

b. Spare processing time. 50% of the available processing time for each processor shall be spare. For synchronous processors, the spare processing time shall be equal to 50% of the period of the highest iteration rate. For non-synchronous systems, 50% of the processing time averaged over a period of continuous operation shall be spare.

c. Spare I/O Capacity. The spare I/O channel capacity shall be equal to 50% of the total installed I/O channel capacity. The spare interface equipment shall be distributed such that 50% spare for each type of channel shall exist for each separate interface when the system is installed and accepted.

3.2.1.4.2 OPERATIONAL SYSTEM SOFTWARE

The operational system software shall consist of one or more of the following: developed software, reusable software, COTS software, and modified previously-developed software. The system software shall consist of applications programs, support programs, and control programs required to meet the performance requirements of this Specification.

3.2.1.4.2.1 SOFTWARE DEVELOPMENT REQUIREMENTS

New software procured under this Contract shall be developed using recognized modern software engineering methods All machine dependent code and compiler dependent code shall be logically grouped into separate packages with meaningful names. The complexity of the software shall be such that separately compilable units have a McCabe Cyclomatic Complexity measure of no greater than 20. Adaptation of previously-developed software to make it fully compliant with the MILES 2000 requirements shall also be accomplished using recognized modern software engineering methods.

3.2.1.4.2.2 RUN TIME ENVIRONMENT

If used, the run time environment shall consist of COTS real-time operating systems.

3.2.1.4.2.3 FIRMWARE

Code or data which is stored in hardware devices (e.g., in a Programmable Read Only Memory) is software and shall be incorporated into the appropriate Computer Software Configuration Items (CSCI) with the same requirements as other software.

3.2.1.4.3 SEE

The SEE shall provide the Contractor with an environment to design, code, and test the system software. The SEE shall provide for the maintenance of the system software following the fielding of the MILES 2000 system. The SEE shall consist of COTS hardware and software, shall be independent of the operational system, and shall include, at a minimum, the following components:

3.2.1.4.3.1 SEE SOFTWARE

The SEE shall consist of the software tools required for the development and life cycle support of all MILES 2000 software products (e.g., code, diagrams, documents, etc.). For developmental systems, the Programming Support Environment (PSE) software tools shall include the following:

a. A validated compiler for the host and target machines, assemblers, operating systems, and utilities such as linker-loaders, source level debuggers, and command language processors. The host machine compiler shall be validated prior to the start of software preliminary design. The target machine compiler shall be validated prior to the start of software detailed design.

b. Computer Aided Software Engineering (CASE) tools fully capable of supporting the adopted development methodology.

c. Software Configuration Management tool.

3.2.1.4.3.2 SEE HARDWARE

The SEE hardware shall consist of computer systems, peripherals and other hardware components required for the development of the MILES 2000 software products. Peripheral equipment and bus and network interfaces shall be compatible with those of the operational computer system. The SEE hardware shall include, at a minimum, the following components:

a. Host computer system.

b. Disk storage unit(s) sized to support software development.

c. A data archival unit compatible with the host computer system for archival, configuration management, and restoration purposes.

d. Firmware support equipment and tools.

e. Sufficient quantities of unique system hardware to support development and testing of the software.

3.2.1.5 FALSE ALARM RATE

The MILES 2000 training system shall have a cumulative false alarm rate of not more than one false alarm per 100 hours of field operations for each of the following quantities of MILES 2000 systems:

a. 100 Individual Weapon Systems

b. 50 Combat Vehicles Systems

c. 50 Independent Target Systems

d. 50 Crew Served Weapon Systems

3.2.1.6 INSTALLATION AND REMOVAL REQUIREMENTS

All MILES 2000 systems shall be installed, operated, and removed without physical damage to or permanent modification of the host vehicle and weapon system.

3.2.1.7 MOUNTING

MILES 2000 system components that are mounted in host vehicles shall be out of the way of crew operators and shall be as transparent as possible to the crew.

3.2.1.7.1 MOUNTING DEVICES

Mounting devices shall include all devices required to secure MILES 2000 system components to the host platform. For vehicles, mounting devices shall electronically and mechanically couple into the host vehicle system for a training exercise. Fasteners manipulated by the soldiers in the field shall be of the captive type.

3.2.1.8 INTERFACING CABLING

Interfacing devices shall include electrical cables, connectors, and couplers to interconnect MILES 2000 system components with each other. The cables, connectors, and couplers to interconnect Combat Vehicle System and Independent Target System components to the

host vehicle systems shall be provided. All cables attached to either the vehicle or targets shall be by temporary means. All MILES 2000 cables shall be clearly marked with designated function, cable part number, connector numbers, and reference designator. Connectors shall be color coded for installation when both mating connectors are being provided within the MILES 2000 system.

3.2.1.9 TRANSIT CASES

MILES 2000 device and system level transit cases shall be used to protect MILES 2000 components during transportation, storage, and handling. The cases shall be designed to hold all the components of one or more kits of a particular configuration. The transit case(s) shall be built to comply with ATA Specification 300, category I container. The transit case shall be polyethylene with recesses molded in to provide protected areas for attachment of all hardware. Male stacking ribs shall be molded into the top surface with corresponding female ribs molded into the bottom surface. The container shall be self draining in the upright position. Indexing and anti-shear features shall be molded into the main body and lid of the case. Transit cases requiring 4-man lift shall have handles on all four sides.

3.2.2 PHYSICAL CHARACTERISTICS

This section specifies the minimum required physical characteristics of all MILES 2000 systems and devices, with the exception of the SEE.

3.2.2.1 WEIGHT

All MILES 2000 component assemblies shall be transportable and maneuverable by one man. When assembled in their respective operating configuration, the weight of each MILES 2000 component shall not exceed that prescribed by the two man lift and carry requirements of MIL-STD-1472. The weight and center of gravity of the MILES 2000 devices shall not impede the carrying, movement and functioning abilities of the individual or crew in conducting training.

3.2.2.2 SIZE

The MILES 2000 system components and devices shall be minimized such that they do not impede the carrying, movement, and functioning abilities of the individual, crew, and host platform in conducting training.

3.2.2.3 POWER

All MILES 2000 system and devices shall have a self- contained power system or be powered by the vehicle's power supply system. If powered by host vehicle power, a self-contained backup power source independent of the vehicles power supply system shall be provided. For systems and devices not operated by the vehicle's power supply, a commercially-available power source shall be used.

3.2.2.3.1 POWER CONTROL

The MILES 2000 power supply shall satisfy the following power control requirements:

a. The Combat Vehicle System and Independent Target System shall have an on/off function which restores/inhibits the power from the source to the system. The on/off function shall have a guard to prevent accidental actuation.

b. All MILES 2000 components that receive their primary power from a host vehicle power supply system shall perform the following functions:

(1) Operate with and provide a means of protection from vehicle battery voltage and current sags, surges and transients.

(2) Operate within the range of 16 to 33 volts DC, with a peak ripple of seven volts containing a ripple frequency between 50 Hz and 200 kHz.

(3) Provide transient protection in addition to the conducted susceptibility requirements described in paragraph 3.3.2.1. The transient protection shall be capable of handling a transient of both positive and negative 250 volts with a rise time of 50 nanoseconds recurring at the rate of one transient per second, as defined by Paragraph 6.2.3, MIL-STD-1275.

(4) Automatically switch to an auxiliary battery in the event of the loss of vehicle power. In the event of loss of vehicle power, the MILES 2000 system shall remain operational with no interruption in performance.

3.2.2.3.2 POWER OPERATION

The MILES 2000 power supply shall satisfy the following power operation requirements:

a. The Individual Weapon Laser Transmitter Unit(s) shall be powered by a power source which shall implement a minimum of 10,000 shots over a period of 100 hours of field use before power source replacement is required. The Crew Served Weapon System and Surrogate Weapon System Laser Weapon Simulators(s) shall be powered by a power source which shall implement a minimum of 60 shots over a period of 100 hours of field use before power source replacement is required.

b. The Target System shall provide a minimum of 100 hours of continuous operation without power source replenishment.

3.2.2.3.3 BATTERIES

If non-rechargeable batteries are used as a power source for a system or device, they shall be easily accessible to the operator or maintenance personnel without need for special tools. Batteries intended to be changed by field personnel shall take no more than three minutes to replace.

3.2.2.4 FINISH

All exterior surfaces of MILES 2000 components and devices shall be treated to resist corrosion or deterioration due to exposure to the elements described in section 3.2.5. Finishes and coatings shall be as prescribed by MIL-STD-171.

3.2.2.5 COLOR

Selection of color for all painted surfaces shall be the low visibility, lusterless, nonreflective type. The color of the components mounted on vehicles or personnel shall be green or black, with the exception of surfaces required for the transmission or reception of electromagnetic signals.

3.2.2.6 PRINTED WIRING BOARDS

Circuit card assemblies and printed wiring boards shall be fabricated IAW requirements of ANSI/IPC-D-275 and ANSI/IPC-RB-276. When class 1, 2, or 3 standards are listed, the boards shall meet or exceed the Class 2, service electronic products, standards.

3.2.2.7 TRANSPORTABILITY

System components and devices, when packed in their respective transit case, shall not exceed 90.265 kilograms for a four man lift and carry, and indicated by warning labels as prescribed by MIL-STD-1472. All MILES 2000 systems, when packed in their transit cases, shall withstand damage due to stresses incidental to movement, handling in transit, and tie-down aboard common carrying vehicles such as aircraft or trucks.

3.2.3 RELIABILITY

Each MILES 2000 system and device shall have a minimum acceptable Mean Time Between Failure (MTBF) requirement as shown below.

MTBF Of Each MILES 2000 Device

DEVICE	MTBF (HRS)
Combat Vehicle System	480
Independent Target System	910
Crew Served Weapon System	950
Individual Weapon System	690
Surrogate Weapon System	690
Controller Device	1900
AAR System	500
SEE System	500

3.2.4 MAINTAINABILITY

The maximum acceptable Mean Time to Repair (MTTR) for each MILES 2000 system and device, with the exception of the SEE, shall be 60 minutes or less.

3.2.5 ENVIRONMENTAL CONDITIONS

Devices and component parts, units, and subassemblies of MILES 2000, with the exception of the SEE, shall operate and be stored under the environmental conditions described below.

3.2.5.1 HIGH TEMPERATURE

MILES 2000 system components and devices shall comply with the following temperature requirements:

a. Externally Mounted components shall operate in an environment with a maximum temperature of 49 degrees Celsius and Solar Loading of 1120 W/m².

b. All internally-mounted components shall operate in an environment with a maximum temperature of 49 degrees Celsius.

c. All internal and external components shall operate after being stored in an environment with a maximum temperature of 70 degrees Celsius.

3.2.5.2 LOW TEMPERATURE

Minimum operating temperature shall be -18 degrees C and the minimum storage temperature shall be -33 degrees C.

3.2.5.3 SHOCK

MILES 2000 components and devices, excluding the Small Arms Alignment Fixture, shall not be damaged when subjected to the specified shock spectrum of MIL-STD-810, Method 516.4, Procedure I - Functional Shock. Components and devices in their transit cases shall not be damaged when subjected to the recommended drop test of Table 516.4-II and Procedure IV - Transit Drop.

3.2.5.4 VIBRATION

MILES 2000 components and devices shall not be damaged when subjected to the specified vibration limits of MIL-STD-810. The requirements of MIL-STD-810 shall be as follows:

a. The Combat Vehicle System components and Independent Target System components shall not be damaged when subjected to Method 514.4, Category 8 (Ground Mobile).

b. The Crew Served Weapon System components, Surrogate Weapon System Components, AAR System, and Small Arms Alignment Fixture shall continue to function after being subjected, in their transit cases, to Method 514.4, Category 3 (Loose Cargo). Individual Weapon System components and the Controller Device shall continue to function after being subjected, without transit cases, to Method 514.4, Category 3 (Loose Cargo).

3.2.5.5 HUMIDITY

MILES 2000 component and devices shall not be damaged during operations under relative humidity conditions up to 100%.

3.2.5.6 RAIN

MILES 2000 components, devices, and all transit cases shall not be damaged when subjected to the following limits. Those components and devices subjected to the immersion test shall not be subjected to the rain test.

Rainfall rate:	10 centimeter/hour
Droplet size:	0.5 millimeter to 4.5 millimeters
Wind velocity:	64 kilometers/hour

3.2.5.7 SAND AND DUST

MILES 2000 components and devices shall not be damaged when subjected to the following limits:

Blowing dust air velocity:	8.9 meters/second
Dust concentration:	10.6 $\pm$7 g/cubic meters
Dust composition:	Silicon Flour

MILES 2000 externally mounted Combat Vehicle System and Independent Target System components and devices shall not be damaged when subjected to the following limits:

Blowing sand air velocity:	29 meters/second
Sand concentration:	1.1 $\pm$0.25 g/cubic meters

3.2.5.8 IMMERSION

The Individual Weapon Systems, all Combat Vehicle System components mounted on the exterior of the vehicle, and all Independent Target System Components mounted on the outside of the target shall show no evidence of water leakage when immersed in water to a depth of one meter IAW MIL-STD-810.

3.2.5.9 CORROSION

Internal circuitry and components shall be treated to resist corrosion and deterioration due to condensation.

3.3 DESIGN AND CONSTRUCTION

The general requirements for the design and construction of the MILES 2000 hardware shall conform to MIL-STD-454 and the following requirements.

3.3.1 MATERIAL, PROCESSES, AND PARTS

The design of MILES 2000 components and devices shall maximize the use of COTS and Non-Developmental Items (NDI) products.

3.3.2 ELECTROMAGNETIC RADIATION

Each MILES 2000 component and device shall operate without being a victim to site generated or self-generated electromagnetic radiation. No component of the MILES 2000 shall be a source of electromagnetic interference, when operated in its intended manner as a training device, to other site operated electronic or electrical equipment.

3.3.2.1 CONDUCTED SUSCEPTIBILITY

MILES 2000 components and devices shall not exhibit any malfunction, degradation of performance, or deviation from operational parameters when the power leads are subjected to a test signal levels described by MIL-STD-461, paragraphs 5.3.4, 5.3.4.1, and 5.3.4.2 for conducted susceptibility, CS101, curve #2, nominal 28 volts DC or below.

3.3.2.2 RADIATED EMISSIONS

The radiated emission limits of MIL-STD-461, RE102, for electric fields, ground installed equipment, shall be met for the frequency range of ten kHz to 18 GHz. The MILES 2000 components and devices when operating shall be not be a source of radiated emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviations from operational parameters to adjacent operating electronic or electrical equipment.

3.3.2.3 CONDUCTED EMISSIONS

The conducted emission limits of MIL-STD-461, CE102, for conducted emissions, power leads, shall be met for the frequency range of ten kHz to ten MHz. The MILES 2000 components and devices when operating shall not be a source of conducted emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviation from operational parameters to other operating electronic or electrical equipment, when connected to the same source of power or interconnected for the purpose of control or data exchange.

3.3.2.4 RADIATED SUSCEPTIBILITY

The MILES 2000 training device components shall be able to operate in the following radiated electrical field levels without a degradation in performance.

FREQUENCY RANGE	ELECTRIC FIELD INTENSITY
10 kHz to 2 MHz	20 Volts/meter
2 MHz to 30 MHz	50 Volts/meter
30 MHz to 1 GHz	50 Volts/meter
1 GHz to 18 GHz	50 volts/meter

3.3.2.5 OPTICAL INTERFERENCE

The MILES 2000 systems shall meet the requirements of 3.2.1.6 for the operation (false kills) of the MILES 2000 detectors to include reflection of its corresponding laser beam.

3.3.3 NAMEPLATES AND PRODUCT MARKING

MILES 2000 name plates, other identification, instructions, and informational plates shall be IAW MIL-P-15024. Assemblies, subassemblies, and parts shall be marked IAW MIL-STD-130.

3.3.4 WORKMANSHIP

Workmanship shall be IAW Requirement 9 of MIL-STD-454.

3.3.4.1 SOLDERING

Electrical and electronic soldering shall be accomplished IAW recognized practices without the use of ozone-depleting substances, in compliance with Public Law 102-484.

3.3.5 INTERCHANGEABILITY

MILES 2000 system component interchangeability shall be as prescribed by Requirement 7 of MIL-STD-454. Items performing like functions within the system shall be interchangeable.

3.3.6 SYSTEM SAFETY

Any design or modifications shall be IAW Requirement 1 of MIL-STD-454, 29 CFR 1910, and National Fire Protection Association Codes. The MILES 2000 system shall provide fail-safe features for safety of personnel during installation, operation, maintenance, testing, support activities, and disposal. COTS equipment shall be certified as meeting the requirements of a nationally recognized safety testing laboratory (such as Underwriters Laboratory). Training

equipment that can be mistaken for tactical equipment shall be marked “FOR TRAINING USE ONLY”. As a minimum, the following areas shall be considered in the MILES 2000 design:

3.3.6.1 ELECTRICAL SAFETY

Electrical circuitry and installation shall comply with the requirements of the National Electric Code (ANSI/NFPA 70-93) and MIL-STD-454 (Requirement 1, Personnel Safety, and Requirement 8, Electrical Overload Protection). Danger, caution, and warning signs shall be designed and used IAW ANSI/NEMA Z535.3-91 and ANSI/NEMA Z535.4-91 to warn user personnel of specific hazards such as voltage, current, and thermal. The use of batteries, including installation and marking, shall be IAW MIL STD 454, Requirement 27 (Batteries). Batteries shall be sufficiently separated from electronic components to prevent damage from corrosion.

3.3.6.2 HAZARDOUS MATERIALS

The MILES 2000 training system shall not incorporate any asbestos. Glass fiber materials shall not be used as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel. When maintenance procedures require access to glass fibers, such as insulation, a proper caution note shall be provided. Polyvinyl chloride (PVC) materials shall not be used in the crew compartment. Ozone-depleting substances, such as Halon, shall not be used. The MILES 2000 training system shall preclude exposure of personnel or the environment to excessive levels of toxic, carcinogenic, or otherwise hazardous materials as defined by the Occupational Health and Safety Agency (OSHA), Environmental Protection Agency (EPA), and the Department of Transportation (DOT).

3.3.6.3 MECHANICAL SAFETY

Moving parts shall be guarded or provided with safety devices to prevent mechanical injury to operator and maintenance personnel. Edges and corners shall be rounded and free from burrs. Center of gravity shall be such that MILES 2000 system components and devices are stable and easy to handle.

3.3.6.4 PERSONNEL SAFETY

The design shall be such as to provide maximum safety to personnel and MILES 2000 training system equipment when installing, operating, adjusting, and maintaining the equipment. The MILES 2000 systems shall not exceed steady state or impulse noise levels defined in MIL-STD 1474. The following paragraphs of MIL-STD 1472 shall apply: 5.9.11.3 for weight limits and weight labeling; 5.9.11.5 for handles and grasp areas; and 5.13 for hazards and safety requirements.

3.3.6.5 IONIZING RADIATION

Measurements shall be taken to ensure that monitors do not have a higher x-radiation exposure rate than 0.5 milliroentgen (mR) per hour at a distance of 5 centimeters from an external point as required in section 1020.10 of Public Law 90-602, The Radiation Control for Health and Safety Act.

3.3.6.6 LASER SAFETY

Laser equipment, system design, written operator manuals, and maintenance instructions shall conform to CFR Title 21, subchapter J, part 1040. For those requirements of 21 CFR 1040 that can not be met due to operational requirements, an exemption shall be requested from the Government and MIL-STD-1425 shall be used as the design requirement for the items listed above. If exempted, the laser shall have a label of exemption from FDA standards IAW MIL-STD-1425. Hazard classification shall be IAW ANSI Z136.1-1993. When a Class 3b laser is necessary due to operational requirements, rather than a class 1 or Class 3a, the laser system shall meet the Class 3b requirements with the following exceptions and additions:

a. The laser emission shall be kept to the lowest possible level which will allow performance from the system. The Class 3b laser system shall meet at least two of the following three conditions. If only two of the conditions can be met, the third condition cannot be exceeded by more than a factor of two in either energy output or measuring distance.

(1) The laser output measured through the limiting aperture of 7mm shall not exceed the Class 3a Accessible Emission Limits (AEL) at any location with the beam.

(2) The laser output measured through the limiting aperture of 7mm shall not exceed the Class 1 AEL at any location within the beam beyond 15 meters.

(3) The laser output measured through a 5-cm aperture (simulating 7-power optics) shall not exceed the Class 3a AEL at any location within the beam beyond 15 meters. The optics are assumed to transmit 70% in the near-infrared (0.7 to 1.4m) and 33% in the mid infrared (1.4 to 2.8m) and less than two percent for wavelengths longer than 2.8m. When diode lasers are used, the laser may be an extended source when viewed through seven-power optics.

b. Labeling shall be IAW MIL-STD-1425, according to the hazard classification, and placed such that it is clearly visible. The wording contained in the upper block of the warning design shall be consistent with the perceived hazard.

c. Laser equipment that meets the exceptions mentioned above may be designed IAW requirements of MIL-STD-1425 for a Class 3a laser rather than for a Class 3b laser, but labeled as a Class 3b laser."

3.3.6.7 RADIOACTIVE MATERIAL RESTRICTION IN OPTICAL PRODUCTS

Optical products shall contain no thorium or other source materials, as defined by Title 10, Code of Federal Regulations, Part 40, in excess of 0.05% by weight (500 ppm), or other radioactive materials. Optical products are defined as optical glass constituents or raw materials, optical glass components such as windows, filters, reflectors, prisms, beamsplitters, lens elements and fiber optics, optical assemblies, and optical coatings, except for IR objective lenses. Radioactive materials are defined as radioactive material per item in excess of concentrations listed in Schedule A, Title 10, Part 40, or in quantities greater than 0.001 microcuries.

3.3.7 HUMAN ENGINEERING

Detail design and functionality of the MILES 2000 training system shall be IAW the following sections of MIL-STD-1472: Control 5.1 (Control/display integration); 5.2 (Visual displays); 5.3 (Audio displays); 5.4 (Controls); 5.5 (Labeling); 5.6 (Anthropometry); 5.9 (Design for maintainer); 5.11.1 Portability of Load Carrying; 5.13 (Hazards and safety); 5.15 (User-computer interface).

3.3.7.1 SPEECH INTELLIGIBILITY

Speech Intelligibility requirements shall be IAW MIL-STD-1472, Table VI, Category b, as measured by Method 2.

3.4 MAJOR COMPONENT CHARACTERISTICS

3.4.1 MILES 2000 COMPONENT CHARACTERISTICS

The following subparagraphs describe the minimum required unique performance characteristics of each of the MILES 2000 systems.

3.4.1.1 MILES 2000 COMBAT VEHICLE SYSTEM

The MILES 2000 Combat Vehicle System shall perform IAW the MILES 2000 training system requirements in paragraph 3.2.1.1 through 3.3.7.1 and the following requirements:

a. A MILES 2000 Combat Vehicle System configuration for each of the combat vehicles listed in 30.1 of Appendix A is required. Laser Weapon Simulator(s) shall be provided for simulation of the primary and secondary weapons and their corresponding ranges and maximum rates of fire for each of the Combat Vehicle Systems as listed in 30.1 of Appendix A. The Weapon Simulator(s) transmissions shall be triggered using normal weapon firing procedures. Each configuration shall contain Weapon Simulator(s), Target System(s), a Target Visual Kill Status Indicator, and Combat Vehicle System specific requirements listed below to provide a means of engagement pairing to a MILES attacker and provide lethality assessment at the Combat Vehicle System.

b. The MILES 2000 Combat Vehicle System Manworn Units shall meet the requirements of 3.4.1.4(l). The Manworn Units shall be provided to perform personnel casualty assessment for each of the combat vehicle crew members, as listed in 30.1 of Appendix A.

c. The Target System of each vehicle listed in 30.1 of Appendix A shall be arrayed so that the front aspect, each side aspect, and rear aspect of the turret or hull permits an aspect dependent lethality assessment. As a minimum, a four zone implementation shall be located on the vehicle such that a hit zone representative of the referenced combat vehicle is created, as specified in 3.2.1.2.

d. The Combat Vehicle System shall incorporate an aspect dependent Pk. This includes taking into account the relationship of the vehicle's turret to hull orientation along with hit location information derived from the Target System. The Target System shall provide a means to program Pks for a direct frontal attack, left side/right side flank attacks, rear attacks, and a shot that is received by two adjacent sides of the vehicle (corner shot).

e. The vehicle's Target System shall incorporate the vehicle's Pk, the lethality of the attacker's weapon and ammunition, and the region of impact of a hit to calculate probability of a kill. The vehicle's Target System shall have programmable Pks for the assessments of a firepower kill, a mobility kill, and a communication kill, in that order, when a catastrophic kill is not assessed for a hit from an attacking weapon of the type which could cause a catastrophic kill. The Combat Vehicle System shall perform the following actions for each of the kill conditions:

(1) For a catastrophic kill, inhibit the firing of the vehicle primary weapon Laser Transmitter Unit(s), provide a visual/aural indication to the crew that a catastrophic kill has been assessed, prevent the crew from having external communication transmission using the standard vehicle communication equipment, and initiate a catastrophic kill target visual kill indication.

(2) For a firepower kill, inhibit the firing of the primary weapon Laser Transmitter Unit, provide a visual/aural indication to the crew that a firepower kill has been assessed, and initiate a firepower kill target visual kill indication.

(3) For a mobility kill, provide a visual/aural indication to the crew to stop vehicle motion and initiate a mobility kill target visual kill indication. 20 seconds after the crew has received notification of a mobility kill from the Target System, the Combat Vehicle System shall initiate a cheat kill if it senses vehicle motion. For a cheat kill, the Combat Vehicle System shall perform the same functions as the catastrophic kill defined in (1) above.

(4) For a communication kill, provide a visual/aural indication to the crew that a communication kill has been assessed and initiate a communication kill target visual kill indication. The Combat Vehicle System shall prevent the crew from having external communication transmission using the standard vehicle communication equipment. The Combat Vehicle System shall not disable or interrupt the internal vehicle communication.

f. The Combat Vehicle System's Target System shall assess a hit when no type of kill is assessed from an attacking weapon of the type which could cause a kill.

g. The Combat Vehicle System's Target System shall assess a catastrophic kill if a mobility kill and a firepower kill have been assessed from two separate engagements.

h. The Combat Vehicle System shall perform the following actions in response to a corresponding electronic signal received by the Target System through the data transfer interface.

(1) Perform a hit assessment and assess the appropriate catastrophic kill, firepower kill, mobility kill, communication kill, or hit

(2) Perform an administrative kill, which includes the same actions as a catastrophic kill

(3) Indicate a near miss

(4) Reset the Combat Vehicle System

(5) Resurrect the Combat Vehicle System

(6) Synchronize the internal clock

(7) Modify the Pks of the Combat Vehicle System's Target System

(8) Run BIT

(9) Modify the System's PID.

i. The vehicle's Target System shall inject voice cues into the vehicle intercom system to communicate the assessment of near misses, hits, and catastrophic, firepower, mobility, and communication kills.

j. The M1/A1 and M1/A2 Combat Vehicle Systems shall provide the means for the selection of ammunition type on a round by round basis for the gunner and loader, track ammunition quantities, and compare gunner/loader ammunition selections for all primary weapons. If the selection of the gunner and loader does not match, only "near-miss" words shall be sent by the Shooter. The M2 Combat Vehicle System shall provide the means for the selection of ammunition type on a round by round basis for the gunner and track ammunition quantities for all primary weapons. The Combat Vehicle System shall display at each loader station and at the Control Unit, upon command, ammunition selected, ammunition remaining, and reloading status. The Combat Vehicle System shall perform the following additional functions:

(1) Decrement the remaining ammunition count when the corresponding Laser Transmitter Unit is fired.

(2) Inhibit the Laser Transmitter from transmitting the MILES code if a weapon firing is initiated when the vehicle's ammunition load has been expended. (Gunner selection of COAX weapon shall not require loader interaction or matching.)

k. The Combat Vehicle System's Laser Transmitter(s) shall generate, upon activation of the trigger or firing electronic signal of the 120mm, 25mm, and TOW and the firing of blanks by the M240 coax primary weapon, the encoded laser beam(s) to implement the Enhanced MILES Communication Code IAW PMT 90-S002F. For the 120mm, 25mm, and the TOW weapons, actual weapon fire signal shall be used.

l. The MILES 2000 CVS shall store on-board an OPFOR PID, a BLUEFOR PID, and a minimum of 32 vehicle types and their corresponding ammunition types, ammunition basic loads, and vulnerability tables as specified in Appendix B. The PIDs and vehicle types shall be retained in memory such that they are available for selection by authorized personnel upon power up as part of the Combat Vehicle's system initialization. The System shall retain sixteen of these vehicle types and their associated information in permanent memory and the remaining sixteen vehicle types and their associated information shall be held in semi-permanent memory that can be overwritten by downloading additional vehicle types and their vulnerability tables as specified in 3.2.1.3(l).

m. The Control Unit shall be located inside the vehicle's crew area.

n. The Target System shall initiate the target visual kill status indicator to give the visual indications listed in 3.2.1.3(d) for each corresponding event. The visual indication shall perform as follows:

(1) Shall be visible through 360 degrees in azimuth.

(2) Shall provide a flash visible at a distance of not less than 1800 meters in full sun lit standard clear day, as defined in Figure 3-3, with the unaided eye.

(3) Shall flash at a rate of 1.0 $\pm$0.1 Hz.

o. The Combat Vehicle System shall provide a signal to activate the MGSS specified in AMSTI-93-S026. The MGSS interface, at a minimum, shall provide the following:

(1) Generation of a firing command in response to a simulated 120mm weapon firing initiated by the crew.

(2) A safety interlock to eliminate accidental firing of the WESS during maintenance or boresight.

p. The Combat Vehicle System shall provide a signal to the DIFCUE specified in AMSTI-93-S027 when a catastrophic kill has been assessed by the DPCU. The DIFCUE interface, at a minimum, shall provide the following:

(1) Generation of a firing command in response to a catastrophic kill assessment by the System.

(2) A safety interlock to eliminate accidental firing of the weapon effects simulator during maintenance.

q. The time required for the vehicle's crew to perform mounting, system check-out, and boresighting of the Combat Vehicle System shall be one hour or less. The time required for the vehicle crew to remove the Combat Vehicle System shall take one hour or less.

r. The M2\M3 Combat Vehicle System TOW weapon simulation shall meet the requirements of 3.4.1.3 (g) and (j). Except for the M2A3, proper operation of the M2/M3 TOW simulation will require use of the TOW ISU Work-around Box on the vehicle to eliminate errors due to loose coupling between the TOW reticle and the main gun sight. The M2\M3 Combat Vehicle System shall include a means of informing the combat vehicle that the vehicle launcher has a simulated TOW ready to fire.

s. The M2\M3 Combat Vehicle System shall include a WESS assembly that provides visual cues to simulate a TOW missile firing. The WESS assembly, at a minimum, shall provide the following:

(1) Visual flash and smoke events similar to that of the missile being fired.

(2) A safety interlock to eliminate accidental firing of the weapon effects simulator.

(3) If a pyrotechnic approach is proposed, the system must use the standard M22 cartridge.

t. The M2\M3 Combat Vehicle System shall generate a firing command to the WESS in response to a simulated TOW weapon firing initiated by the crew.

u. The M2\M3 Combat Vehicle System shall include a FlashWESS assembly that provides a visual cue to simulate the firing of the 25 mm weapon. The FlashWESS assembly, at a minimum, shall provide the following:

(1) Provide a lamp flash that operates at a rate of fire of the weapon being simulated up to a maximum of 200 flashes per minute.

(2) The flash shall be visible at a distance of 1000 meters in a full sun lit standard clear day, as defined in Figure 3-3, with the unaided eye.

(3) A pyrotechnic shall not be used in the FlashWESS.

v. The M2\M3 Combat Vehicle System shall generate a firing command to the FlashWESS in response to a simulated firing of their respective 25 mm weapon.

w. The MILES 2000 Combat Vehicle System secondary weapon Laser Transmitter(s) shall meet the requirements of 3.4.1.4(b) through 3.4.1.4(k).

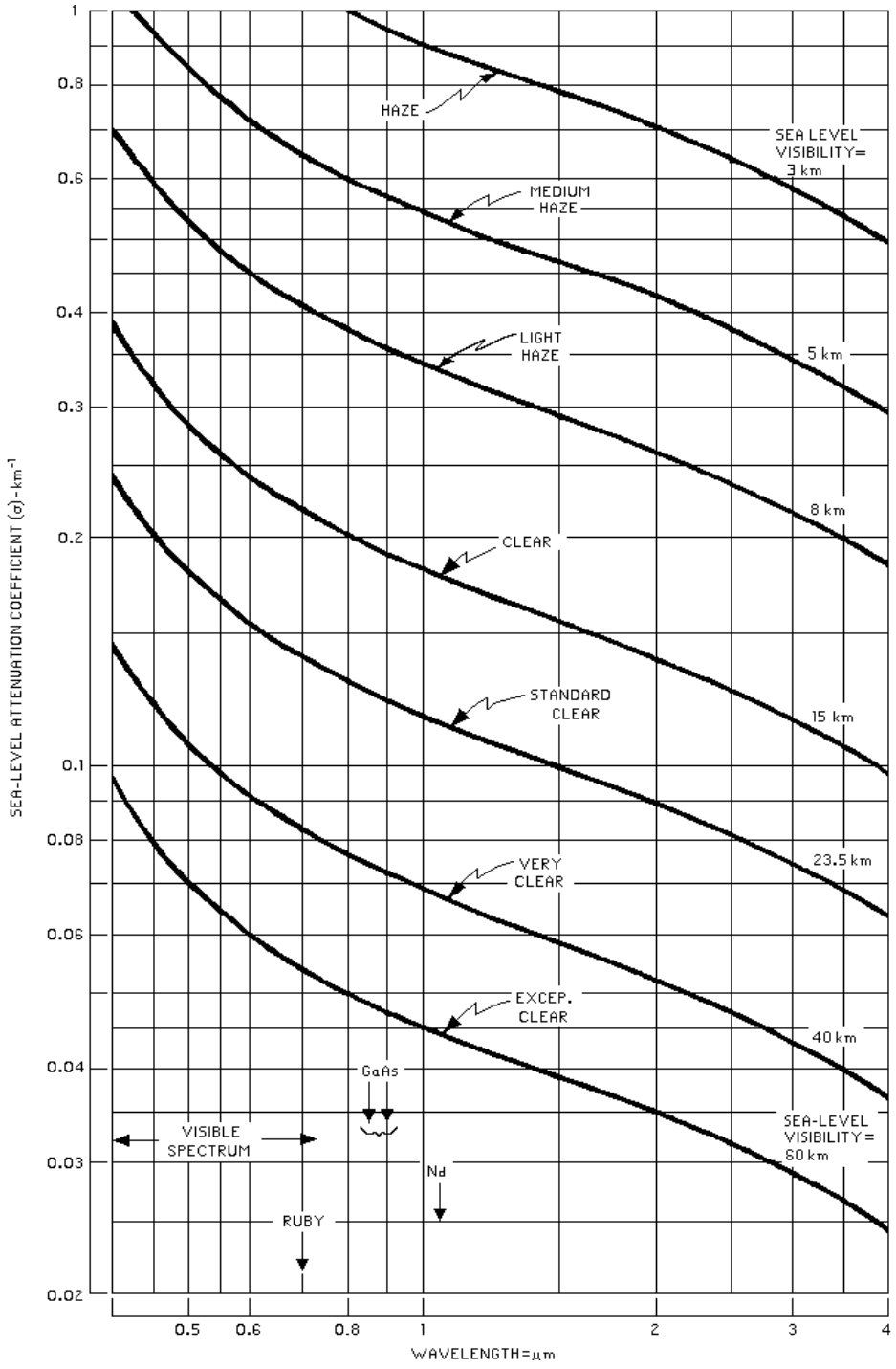

FIGURE 3-3. STANDARD CLEAR DAY

Approximate variation of attenuation coefficient with wavelength at sea level for various atmospheric conditions. Neglects absorption by water vapor and carbon dioxide.

3.4.1.2 MILES 2000 INDEPENDENT TARGET SYSTEM

The Independent Target System shall perform IAW the MILES 2000 training system requirements in paragraphs 3.2.1.2 through 3.3.7.1 and the following requirements:

a. A MILES 2000 Independent Target System configuration for each of the targets listed in 30.2 of Appendix A is required. Each configuration shall provide a means of engagement pairing to a MILES attacker and lethality assessment at the Independent Target System.

b. Each Independent Target System listed in 30.2 of Appendix A shall be configured such that a hit zone representative of the M966 TOW HMMWV target is created, as specified in 3.2.1.2.

c. The Independent Target System shall use the target's Pk and the lethality of the attacker's weapon and ammunition to assess weapon effects on a target. For Independent Target System configurations, the Independent Target System shall have programmable Pks for the assessments of a mobility kill if a catastrophic kill is not assessed when a hit resulted from an attacking weapon of the type which could cause a catastrophic kill. The Independent Target System shall perform the following actions for both kill conditions:

(1) For a catastrophic kill, provide a visual/aural indication to the individuals associated with the target and initiate a catastrophic kill target visual kill indication.

(2) For a mobility kill, provide a visual/aural indication to the crew to stop vehicle motion and initiate a mobility kill target visual kill indication. Twenty seconds after the crew has received notification of a mobility kill, the Independent Target System shall initiate a catastrophic kill if it senses vehicle motion. For a cheat kill, the Independent Target System shall perform the same functions as the catastrophic kill defined in (1) above.

d. The Independent Target System shall perform the following actions in response to a corresponding electronic signal received by the Target System through the data transfer interface.

(1) Perform a hit assessment and assess the appropriate catastrophic kill, mobility kill, or hit

(2) Perform an administrative kill

(3) Indicate a near miss

(4) Reset the Independent Target System

(5) Resurrect the Independent Target System

(6) Synchronize the internal clock

(7) Modify the Pks of the Independent Target System

(8) Run BIT

(9) Modify the System's PID

e. The Independent Target System shall meet the requirements specified in 3.4.1.1(l).

f. The Data Processing and Control Console shall be located inside the cab/drivers areas for wheeled vehicles. The Data Processing and Control Console shall be located inside the turret/crew area for tracked vehicles.

g. The Independent Target System shall activate the target visual kill status indicator to give visual indications when the unit assesses a catastrophic kill or near-miss as specified in 3.4.1.1(n).

h. The time required for an individual to perform mounting and system check-out of the Independent Target System shall be one hour or less. The time required for an individual to remove the Independent Target System shall take one hour or less.

3.4.1.3 MILES 2000 CREW SERVED WEAPON SYSTEM

The Crew Served Weapon System shall perform IAW the MILES 2000 training system requirements in paragraph 3.2.1.1 through 3.3.7.1 and the following requirements:

a. Shall provide a Crew Served Weapon System configuration for each of the weapons listed in 30.3 of Appendix A. Each configuration shall provide a means of engagement pairing to a MILES attacker and lethality assessment at the Crew Served Weapon System. Additionally, the TOW Crew Served Weapon System configuration shall include two Manworn Units that meet the requirements of 3.4.1.4(l). The Manworn Unit shall be provided to perform personnel casualty assessment for the Crew Served Weapon operators.

b. The Crew Served Weapon System shall generate, upon reception of a firing signal, the electronic signals to encode the MILES 2000 Laser Transmitters to transmit the Enhanced MILES Communication Code IAW PMT-90-S002FF.

c. The Target System of each Crew Served Weapon System listed in 30.3 of Appendix A shall be mounted such that a hit zone representative of the Crew Served Weapon is created, as specified in 3.2.1.2.

d. When the Crew Served Weapon System has assessed that a weapon kill has occurred the firing of its corresponding Laser Transmitter shall be inhibited.

e. The Crew Served Weapon System shall contain a device that generates a 74 +14/-6 dB audible signal 24 inches from the signal source each time the system determines either a near miss assessment or a kill assessment IAW 3.2.1.3(d). The kill assessment signal shall stop after the Crew Served Weapon System has inhibited the firing of its Laser Transmitter. Each of the two near miss assessment signal shall be 0.3 up to 1.0 seconds in duration.

f. If the actual components of the crew served weapon being simulated are not utilized, the simulated components shall exhibit the actual weapon's characteristic size, weight, and feel.

g. The Crew Served Weapon System ammunition's simulated time of flight shall be adjustable in its initiation process. The time of flight shall be consistent with the Standard for MILES Communication Code Structure, PMT-90-S002FF, as it applies to guided missiles.

h. The Crew Served Weapon System shall include a WESS assembly that provides visual cues, flash, and smoke to simulate a missile firing. The WESS assembly, at a minimum, shall meet the requirements of 3.4.1.1(s)

i. The Crew Served Weapon System shall provide a triggering signal to the WESS assembly in response to a simulated weapon firing initiated by the crew.

j. The Crew Served Weapon System shall provide an indication to the operator that the missile track time has been completed.

k. The Crew Served Weapon System shall, upon being reset, return to full operational status, default to a preprogrammed ammunition load, and, if in the kill mode, emit an audio signal indicating that it has been reset.

l. The Crew Served Weapon System shall perform the following functions in response to a corresponding electronic signal received by the Crew Served Weapon through the data transfer interface.

(1) Perform a catastrophic kill

(2) Perform an administrative kill

(3) Indicate a near miss

(4) Reset the Crew Served Weapon System

(5) Resurrect the Crew Served Weapon System

(6) Synchronize the internal clock

(7) Modify the Pks of the Crew Served Weapon System

(8) Run BIT

(9) Modify the System's PID

m. The TOW Crew Served Weapon System shall simulate missile tracking requirements IAW PMT-90-S002FF within the adjustable time of flight referenced in 3.4.1.3(g).

n. The Crew Served Weapon shall store on-board and utilize in its MILES engagements an OPFOR PID, a BLUEFOR PID, ammunition type, ammunition basic load, ammunition delay time, and Pk Tables as specified in Appendix G. The PIDs shall be retained in memory such that they are available for selection by authorized personnel upon power up as part of the Crew Served Weapon system initialization. The system shall retain the information in semi-permanent memory that can be overwritten by downloading additional information from the AAR System as specified in 3.2.1.3(l).

o. The Crew Served Weapon Systems shall perform the following functions:

(1) Display ammunition remaining.

(2) Decrement the remaining ammunition count when a round is fired.

(3) Inhibit the Laser Transmitter from transmitting and the WESS from firing if a weapon firing is initiated when the ammunition load has been expended.

p. The TOW Crew Served Weapon shall simulate the TOW day sight and interface with the existing TOW night sight.

3.4.1.4 MILES 2000 INDIVIDUAL WEAPON SYSTEM

The Individual Weapon System shall perform as an Individual Weapon system IAW the MILES 2000 TESS performance requirements in paragraphs 3.2.1.1 through 3.3.7.1 and the following requirements:

a. An Individual Weapon System configuration for each of the weapons listed in 30.4 of Appendix A is required. Each configuration shall provide a means of engagement pairing to a MILES attacker and lethality assessment at the Individual Weapon System.

b. The Individual Weapon System shall be capable of being fired by any individual with a MILES 2000 Manworn Unit who is not in a kill casualty assessment mode. The Laser Transmitter shall transmit the PID of the associated person operating the Individual Weapon System.

c. Shall have a dry fire trigger unit to provide the ability to activate the weapon mounted SAT without firing blank ammunition. The dry fire trigger unit shall meet the

environmental requirements of paragraphs 3.2.5.6 (Rain) and 3.2.5.7 (Sand & Dust). All other requirements of paragraph 3.2.5 are not applicable.

d. Shall have a selectable mode of operation, not dependent on blanks, for use in aligning the laser output with the weapon sighting and for testing. This dry-fire mode shall require controller personnel interaction for selection and shall not be independently available to the weapon operator.

e. Shall operate with blanks as a normal operating condition when mounted on an individual operator weapon. The Individual Weapon System shall generate, upon firing of the blank, the electronic signals to encode the MILES 2000 Laser Weapon Simulator(s) to implement the Enhanced MILES Communication Code IAW PMT 90-S002F. When not in a dryfire mode, the laser simulation of a round or burst of rounds shall be fired only when activated by the firing of blank rounds.

f. Have no interconnecting cables between the SAT and the other components of the Individual Weapon System.

g. Shall provide an indication to the operator that pairing transmission has occurred in response to the firing of a blank round or a trigger pull when in dry-fire mode.

h. The M24 Laser Transmitter Unit shall transmit the M16 MILES weapon code parameters as specified in of PMT-90-S002F.

i. The M249 Squad Automatic Weapon (SAW) Laser Transmitter Unit shall transmit the M60 MILES weapon code parameters as specified in PMT-90-S002F.

j. The M240 Laser Transmitter Unit shall transmit the M60 MILES weapon code parameters as specified in PMT-90-S002F.

k. The time required to perform mounting and boresighting of the Individual Weapon System shall be 15 minutes or less. Use of night vision devices by the soldier shall not impede the boresighting of the Laser Transmitter.

l. Provide an Individual Weapon System’s Manworn Unit that shall:

(1) Assess a kill or near-miss when the Target System receives and decodes a MILES 2000 coded signal and determines the appropriate action IAW PMT-90-S002F. The manworn Pk values to stored and utilized in the casualty assessment are as specified in Appendix H.

(2) Inhibit the wearer from firing any Individual Weapon and Surrogate Weapon System when the Target System has assessed that a kill has occurred.

(3) Have no external power switch. Removal of the power source shall cause a soldier to be assessed as a cheat kill. The Target System shall have a time delay of at least

two but not more than three minutes before assessing a cheat kill to allow for battery replacement.

(4) Perform the following actions in response to a corresponding electronic signal received by the Manworn through the data transfer interface.

(a) Perform a kill
(b) Perform an administrative kill
(c) Indicate a near miss
(d) Reset the Manworn Unit
(e) Resurrect the Manworn Unit
(f) Synchronize the internal clock
(g) Modify the Pks of the Manworn Unit
(h) Run BIT
(i) Modify the System's PID

(5) Contain a device that shall generate a 74 +14/-6 dB audible signal 24 inches from the signal source, for not less than five seconds, each time the Manworn determines a kill assessment IAW 3.2.1.3(d). When the Manworn determines a near miss assessment, the device shall emit a 0.3 up to 1.0 second 74 dB +14/-6 dB signal IAW 3.2.1.3(d).

(6) Stop the kill assessment signal after the Manworn Unit has inhibited the individual wearing the Manworn Unit from firing the Laser Transmitter Unit of an Individual Weapon System and Surrogate Weapon System.

(7) Be mounted such that a hit zone representative of an infantry soldier is created as specified in 3.2.1.2.

(8) Return to full MILES 2000 operational status upon decoding of a reset or resurrection MILES code word.

(9) Contain a data display as specified in 3.2.1.3(h) and 3.2.1.3(i), located on the Manworn Unit. The display shall be readable by the wearer and by observer/controllers standing at a distance of two feet from the manworn.

(10) Have no direct mechanical connection, including electrical wire links, between any item on the helmet, weapon, and soldier's torso.

(11) Provide the detectors, sound device, power supply, and processors into a single Light Force vest.

(12) Store on-board the Manworn an OPFOR PID, BLUEFOR PID, and Pks. The PIDs shall be retained in memory such that they are available for selection by authorized personnel upon power up as part of the Manworn Unit's initialization. The Manworn shall retain the information in semi-permanent memory that can be overwritten by downloading additional information from the AAR System as specified in 3.2.1.3(l).

(13) Can be used with both the Kevlar helmet and softcap headgear.

3.4.1.5 MILES 2000 SURROGATE WEAPON SYSTEM

The Surrogate Weapon System shall perform IAW the MILES 2000 TESS requirements in paragraph 3.2.1.1, paragraphs 3.2.1.4 through 3.3.7.1, and the following requirements:

a. Shall provide a Surrogate Weapon System configuration for each of the weapons listed in 30.5 of Appendix A.

b. Shall generate, upon reception of a firing signal, the electronic signals to encode the MILES 2000 Laser Transmitter Unit(s) to implement the Enhanced MILES Communication Code IAW PMT-90-S002F. The AT-4 Laser Transmitter Unit shall transmit MILES weapon code 15, ammunition types C, D, G, and H, parameters as specified in PMT-90-S002F.

c. If the actual components of the surrogate weapon being simulated are not utilized, the simulated components shall exhibit the actual weapon's characteristic size, weight, and feel.

d. The Surrogate Weapon System shall include a WESS assembly that provides visual cues, flash, and smoke to simulate a rocket firing. The WESS assembly, at a minimum, shall meet the requirements of 3.4.1.1(s).1 through 3.

e. The Surrogate Weapon System shall provide a triggering signal to the WESS assembly in response to a simulated weapon firing initiated by the operator.

f. The AT-4 Laser transmitter shall transmit only when an unfired WESS is connected and fired by the WESS firing device.

g. The Surrogate Weapon System's Laser Transmitter Unit(s) shall be capable of being fired by any individual with a Manworn Unit who is not in a kill casualty assessment mode. The Laser Transmitter Unit(s) shall transmit the PID of the associated person operating the Surrogate Weapon System.

h. The AT-4 Surrogate Weapon ammunition default load shall be adjustable to allow up to nine rockets. This function shall not be independently available to the soldier operating the weapon.

i. The AT-4 Surrogate Weapon System shall perform the following functions:

(1) Display rockets remaining.

(2) Decrement the remaining rocket count when a rocket is fired.

3.4.1.6 CONTROLLER DEVICE

The Controller Device shall be a self-contained unit which shall transmit a message to each target at the ranges listed below in atmospheric conditions as specified in 3.2.1.1(e). The Controller Device shall provide, from remote positions, the following administrative functions: *

a. "Kill" or "near miss" a Combat Vehicle System, Independent Target System, Crew Served Weapon System, and Manworn Unit using the universal kill code or miss code, respectively, IAW PMT 90-S002F for a range of 500 meters, as a minimum.

b. Transmit the Optical Reset Code to reset a previously killed Combat Vehicle System, Independent Target System, Crew Served Weapon System, and the Manworn Unit for a range of 500 meters, as a minimum. The MILES code assignment of the Reset word code shall be MILES code number 36 as specified in PMT 90-S002F.

c. Transmit an Optical Resurrection Code to resurrect a previously killed Combat Vehicle System, Independent Target System, Crew Served Weapon System, and the Individual Weapon System for a range of 500 meters, as a minimum. The MILES code assignment of the resurrection word code shall be MILES code number 30 as specified in PMT 90-S002F.

d. Provide a time programmable internal clock. The clock shall have day, month, year, and time, in military format, synchronized to one second accuracy in a 96 hour period.

e. Transmit a laser beam signal to synchronize remotely the Target System's internal clock to the clock in the Controller Device for a range of 100 meters, as a minimum.

f. Select and transmit the Enhanced MILES weapon codes as listed in PMT-90-S002F, for a range of 100 meters, as a minimum.

g. Decode and display the MILES transmitted code and PID of the MILES 2000 and Basic MILES Laser Transmitter Units for a range of 20 meters, as a minimum.

h. Modify the System's PID

3.4.1.7 AAR SYSTEM

The AAR System shall provide the following functions:

a. Upload information to the MILES Shooter and Target System to initialize it with specific information to uniquely identify its performance capabilities. Data to be uploaded includes weapon type(s), ammunition loads, and vulnerability data commensurate with the system on which the device will be installed.

b. Downloaded data from the MILES Shooter and Target System including, at a minimum, all event data specified in 3.2.1.3(g).

3.4.1.7.1 UPLOAD/DOWNLOAD/INITIALIZE TIME

The AAR System shall take no more than three minutes to perform any of the following functions for the MILES 2000 systems:

a. Uploading of all needed data, to include sets of vulnerability tables.

b. Initialize.

c. Downloading all stored event data.

3.4.1.7.2 AAR SYSTEM STORAGE REQUIREMENTS

The AAR System shall be capable of storing the information required to initialize a minimum of 25 MILES 2000 devices. Additionally, the AAR System shall also be capable of storing the downloaded event records of a minimum of 25 MILES 2000 devices. The AAR System storage medium shall also be subject to the 50% sparing requirement specified in 3.2.1.5.1.

3.4.1.7.3 PERSONAL COMPUTER (PC) COMPATIBILITY

The AAR System shall include either a light-weight portable IBM-compatible computer, or an interfacing device to a PC such that data to be uploaded to the MILES 2000 device can be generated on a PC and the data retrieved from the MILES 2000 device can be read into and manipulated by a PC with the AAR System software. The AAR System interface unit shall meet the environmental requirements of paragraphs 3.2.5.6 (Rain) and 3.2.5.7 (Sand & Dust). All other requirements of paragraph 3.2.5 are not applicable**.**

3.4.1.7.4 AAR SYSTEM SOFTWARE

A software program, run on an IBM PC Compatible computer, shall provide the following capabilities:

a. Accept all recorded event data.

b. Provide the following AAR reports:

(1) A list of each MILES 2000 system's downloaded event records.

(2) A list of all fratricide incidents and the associated PIDs.

(3) A list of each of the downloaded MILES 2000 system's lethality assessment events and the associated event information listed in 3.2.1.3(g).

(4) A list of each of the downloaded MILES 2000 system's firing events and the associated event information listed in 3.2.1.3(g).

(5) A list of each of the downloaded MILES 2000 system's cheat events and the associated event information listed in 3.2.1.3(g).

(6) A list of each of the downloaded MILES 2000 system's administrative events and the associated event listed in 3.2.1.3(g).

c. The ability for the AAR operator to generate ad hoc reports using the downloaded data.

3.4.1.8 BORESIGHT AND ALIGNMENT DEVICE(S)

The Laser Transmitter Units of the Combat Vehicle System, Crew Served Weapon System, and Surrogate Weapon System shall be capable of being boresighted and aligned to the host weapon platforms to allow the systems to perform as specified. If these boresighting requirements include a Boresight and Alignment Device(s), they shall be stand-alone device(s). Once aligned, the above-referenced MILES 2000 system electronics and software components shall maintain alignment for at least ten hours under conditions in 3.2.5.

3.4.1.9 ORGANIZATIONAL TEST SET(S)

If the MILES 2000 Combat Vehicle System does not perform BIT to line replaceable unit level, an organizational test set(s) shall be provided. The test set(s) shall be a small, portable test instrument used to fault isolate MILES 2000 systems to the line replaceable unit level. The unit(s) shall be ruggedized for field use.

4 VERIFICATION

4.1 CLASSIFICATION OF INSPECTION

The inspection/test requirements are classified as follows:

a. Product Qualification Test 4.2.

b. Conformance Inspection 4.3.

4.2 PRODUCT QUALIFICATION TEST (PQT)

Prior to the start of full rate production and following any change in regular production methods, materials, or equipment, a production qualification lot of MILES 2000 System Devices as defined in paragraph 3.1 shall be produced. The same methods, materials, and equipment as those planned to be used during production shall be used.

4.2.1 INSPECTION

Inspections as outlined on Table I and examinations as outlined on Table V shall be performed on all PQT items. If one or more defects are found, it shall be considered a failure.

Note 1: Classification of Defects and Characteristics and Sampling Plans are as defined below:

a. Minor defect. A minor defect is a defect that is not likely to reduce materially the usability of the unit or product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit. There are no minor defects at the system and major component levels of this Specification.

b. Major defect. A major defect is a defect other than critical that is likely to result in failure, or to reduce materially the usability of the MILES 2000 for its intended purpose.

c. Critical defect. A critical defect is a defect that judgement and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the product; or a defect that judgment and experience indicate is likely to prevent performance of the tactical function of the MILES 2000 or a major part thereof.

TABLE I. INSPECTION REQUIREMENTS

TEST OR EXAMINATION	NOTE 1 CLASSIFICAITON (GROUP)	REQUIREMENT PARAGRAPH	EXAMINATION METHOD PARAGRAPH
System Level			
Modified Performance Test	Major	3.2.1	4.4
Subsystem Level			
Safety Exam/Test	Critical	3.4.1	4.4
Workmanship	As Required	3.3.4	4.5.8
Modified Performance Test	Major	3.2.1	4.4
Circuit Card/Part Level			
Performance	Major	Contractor Procedures	MIL—STD—454 Requirement
Workmanship	Sampling	3.3.4	4.5

4.2.2 MODIFIED PERFORMANCE TEST

The Modified Performance Test consists of in-plant measurements which correlate to the actual parameters of the system, i.e., signal characteristics such as power level, frequency, signal to noise, coding, speed, etc. as opposed to actual field measurements of range area of coverage, etc., as were performed in the qualification test.

4.2.3 TESTS

The generalized tests and demonstrations referenced in Table V shall be performed by the Contractor on all systems which have passed the inspection of 4.3.1. Unless otherwise stated for all tests and demonstrations which require pre- and post-operational tests, the operational checkouts shall consist of the tests referenced Conformance Inspection A. Failure of any system to pass all tests and demonstration in Table II shall constitute failure of first article.

4.2.4 SYSTEM INTEGRATION

The Contractor shall perform system-level tests both in the Contractor's facility and in the field. These tests shall demonstrate conformance with the system level requirements as defined in Section 3.

TABLE II. Product Qualification Tests/Demonstrations

TEST	REQUIREMENT	TEST METHOD
Reliability	3.2.3	4.5.4
High Temperature/Solar Radiation	3.2.5.1	4.5.6.1
Low Temperature	3.2.5.2	4.5.6.2
Shock	3.2.5.3	4.5.6.3
Vibration	3.2.5.4	4.656.4
Humidity	3.2.5.5	4.5.6.5
Rain	3.2.5.6	4.5.6.6
Sand	3.2.5.7	4.5.6.7
Dust	3.2.5.7	4.5.6.7
Immersion	3.2.5.8	4.5.6.8
Salt Fog	3.2.5.9	4.5.6.9
Corrosion	3.2.5.10	4.5.6.10
EMI	3.3.2	4.5.7

4.3 NOT USED

4.4 NOT USED

4.5 QUALIFICATION METHODS

If a Specification characteristic is identical for several subsystems, Government approval may be obtained to perform qualification on a representative subsystem.

4.5.1 Operational System Software

The software shall be examined during Software PCA and Qualification Testing to ensure that it meets the MILES 2000 TES requirements.

4.5.1.1 Software Development Requirements

The Contractor shall certify that the software developed for the MILES 2000 uses established software engineering methodologies. The software code shall be visually examined to ensure that machine compiler dependent code are grouped in separate packages. An analysis shall be provided showing all CSUs have a McCabe cyclomatic complexity measure less than or equal to 20. The requirement of 3.2.1.5.2.1 shall be considered verified upon successful execution of the Contractor-prepared, Government-approved software test procedure and through audits and reviews.

4.5.1.2 Firmware

The Contractor shall certify that any firmware developed meets the same developmental requirements as the software. The code and documentation shall be visually examined to ensure compliance.

4.5.2 Transit Cases

The MILES 2000 system level transit cases shall be tested to ensure protection of MILES 2000 unit components during transportation, storage, and handling and shall comply with Section 3.2.1.11. The transit cases shall be verified by paragraphs 4.5.6.1, 4.5.6.2, 4.5.6.3, 4.5.6.4, 4.5.6.6, and 4.5.6.9.

4.5.3 Transportability

The requirements of 3.2.2.7 shall be verified by analysis, demonstration, certification, and examination. Verification that the MILES 2000 hardware does not exceed the weight and balance envelope shall be by demonstration and analysis. Verification that the MILES 2000 components and support equipment are housed in designated containers shall be by analysis and examination. Label requirements shall be IAW 3.3.3.

4.5.4 Reliability

The minimum acceptable MTBFs specified in this Specification shall be verified in a reliability test IAW MIL-HDBK-781, Test Plan XX. The environmental conditions for the reliability test shall be as set forth in paragraph 4 of MIL-STD-781, Section 5 of MIL-HDBK-781, and this Specification. The definition of a relevant failure and detailed conditions shall be as set forth in paragraph 4 of MIL-STD-781.

4.5.5 MAINTAINABILITY

A MTTR of 60 minutes or less for each MILES 2000 system and device, with the exception of the SEE, shall be verified by demonstration.

4.5.6 ENVIRONMENTAL CONDITIONS

The requirements of 3.2.5. shall be considered verified after successful completion of 4.5.6.1 through 4.5.6.10. Component parts, units, and subassemblies of MILES 2000 shall operate and be stored under the environmental conditions described below.

a. The Contractor shall arrange if desired to allow the post-test inspection and operational checkout for preceding test to serve as the pre-test inspection and operational checkout for the next test.

b. The Contractor shall perform tests on a selected sample of each type MILES 2000 equipment. In the event of a failure of a sample to satisfactorily complete a test, the Contractor shall inspect every component of that type for the presence of a fault responsible for failure and shall correct such fault prior to randomly selecting the next sample for retest. No percentage defective is allowable.

c. Unmodified, stand-alone commercial equipment which is covered for repair or replacement by an original equipment manufacturer's warranty and/or which is tested to MIL-STD-810 requirements equal or higher than specified herein shall be certified as conforming without necessity for additional environmental testing.

4.5.6.1 HIGH TEMPERATURE

The requirements of 3.2.5.1 shall be verified by test IAW MIL-STD-810, Method 505.3, Procedure I, for all externally-mounted components. Internally and externally-mounted components shall be tested IAW accordance with MIL-STD-810, Method 501.3, Procedure I - Storage. The internally-mounted components shall be tested IAW MIL-STD-810, Method 501.3, Procedure II - Operating. The following conditions shall apply:

Procedure I - Solar Radiation Operating

a. The high temperature requirement shall be +49 degrees C for operation and 1120 W/m^2.

b. The test unit shall be fully assembled into its operation state, with power applied.

c. Temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall consist of three 24 hour cycles.

e. An operational check-out shall be conducted during the period of maximum response in each temperature cycle and at the conclusion of the test.

Procedure I – Storage

a. The high temperature storage requirement shall be +70 degrees C.

b. The test unit shall be properly packaged and in its storage configuration.

c. The temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall be conducted for seven cycles (each cycle shall be 24 hours in duration).

e. An operational check-out shall be conducted at the conclusion of the test.

Procedure II – Operation

a. The high temperature requirement shall be +49 degrees C for operation.

b. The test unit shall be fully assembled into its operation state, with power applied.

c. Temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall consist of three 24 hour cycles.

e. An operational check-out shall be conducted during the period of maximum response in each temperature cycle and at the conclusion of the test.

4.5.6.2 LOW TEMPERATURE

The requirements of 3.2.5.2 shall be verified by test IAW MIL-STD-810, Method 502.3, Procedures I (Mild Cold, Induced for 24 hours), MIL-STD-810, Method 502.3, Procedure II (Basic Cold, Operational, for three cycles), and the following conditions:

Procedure I – Storage

a. The low temperature storage requirement shall be -33 degrees Celsius.

b. The test unit shall be properly packaged and in its storage configuration.

c. The temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall be conducted for three cycles (24 hours).

e. An operational check-out shall be conducted at the conclusion of the test.

Procedure II – Operation

a. The low temperature requirement shall be -18 degrees Celsius for operation.

b. The test unit shall be fully assembled into its operation state.

c. Temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall consist of three 24 hour cycles.

e. An operational check-out shall be conducted at the last hour of each 24 hour cycle and at the conclusion of the test.

4.5.6.3 SHOCK

The requirements of 3.2.5.3 shall be verified by test IAW MIL-STD-810, Method 516.4, Procedure I - Functional Shock, Figure 516.4-4. Components and devices in their transit cases shall also be subjected to the recommended drop test of Table 516.4-II and Procedure IV - Transit Drop.

a. The test unit system shall be fully assembled into its operation state for Procedure I.

b. For Procedure I, use the Operational Test For Ground Equipment test shock response spectrum of Figure 516.4-4.

c. An operational check-out shall be conducted at the conclusion of the test.

4.5.6.4 VIBRATION

Any system component that is used on more than one vehicle shall be verified once using the vibration program data of the most severe platform. The requirements of 3.2.5.4 shall be verified IAW MIL-STD-810 as follows:

Method 514.4, Category 8 (Ground Mobile):

a. The test unit shall be fully assembled into its operational state.

b. The narrowband random-on-random vibration program data defined by the table listed in Table VI shall be used.

c. The M1A1 vibration test phases shall be run for 60 minutes and the M113 vibration test phases shall be run for 40 minutes, for a test time of 240 minutes per axis, and a total test time of 12 hours.

d. An operational check-out shall be conducted at the conclusion of the test.

Table VI

Vehicle System	MIL-STD-810 APPENDIX A Table	Table Description
M1 Series Tanks	514.4-AIV	M1A1 Tank Wegman Hull Rack
M2/M3 Bradley *	514.4-AXIX	M113 Crew Compartment Walls
M113 APC	514.4-AXIX	M113 Crew Compartment Walls
Independent Target System	514.4-AII	Secured Cargo Transportation, Composite Wheeled Vehicle

* The Universal Laser Transmitter (ULT) for the M2/M3 Bradley vehicles shall undergo the M1A1 Tank Wegman Hull Rack testing.

Method 514.4, Category 3 (Loose Cargo)

a. The Individual Weapon System components and Controller Gun shall be assembled in their operational mode, without transit cases. The Crew Served Weapon System components, Surrogate Weapon System components, and Small Arms Alignment Fixture shall be assembled in their transit case transport mode.

b. Procedure III - Category 3 - Loose cargo transport shall be performed for a duration of 30 minutes.

c. An operational checkout shall be performed at the conclusion of the test.

4.5.6.5 HUMIDITY

The requirements of 3.2.5.5. shall be verified IAW MIL-STD 810, Method 507.3, Procedure I (Natural), Cycle 3, with the following requirements:

a. The test unit shall be fully assembled into its operation state.

b. The test cycle used shall be as defined by Cycle 3 in Table 507.3-I and Figure 507.3-1.

c. Each cycle shall be 24 hours in duration.

d. The test duration shall be for ten cycles with a quick look and operational check-out after the fifth cycle.

e. For “Group C” testing, the duration shall be two cycles.

f. An operational check-out shall be conducted at the conclusion of the test.

4.5.6.6 RAIN

Requirements of 3.2.5.6 shall be verified by test IAW MIL-STD-810, Method 506.3, Procedure I - Blowing Rain. The test unit shall be subjected to the following limits:

a. The test unit shall be fully assembled into its operation state.

b. The rainfall rate shall be a minimum of four inches per hour.

c. The wind velocity shall be a minimum of 40 miles per hour.

d. The temperature of the test unit shall be at least ten degrees Celsius greater than the rain temperature at the beginning of each 30 minute exposure period.

e. The test shall be conducted for a period of 30 minutes per face until all faces have been exposed.

f. The failure criteria shall be degradation of performance of the test unit following the rain test and unconditional failure as defined in MIL-STD-810, Method 506.3, paragraph I-4.1.2. In addition, an operational check-out shall be conducted at the end of the test.

g. The transit case requirement of 4.6.2 shall be verified by the above test procedure or through certification, by manufacturer, of analogous test procedures and data.

4.5.6.7 SAND AND DUST

The requirements of 3.2.5.7 shall be verified by test IAW MIL-STD-810, Method 510.3, when subjected to the following limits (Test items shall be powered on during test):

a. Sand. The test unit shall be tested IAW MIL-STD-810, Method 510.3, Procedure II, for blowing sand, and with the following requirements:

(1) The test unit shall be fully assembled into its operation state and all optics, windows and front panels may be protected.

(2) The sand particle size shall be from .15 to .85 millimeters and the concentration of 1.1 grams per cubic meter.

(3) The air velocity in the test chamber shall be from 18 to 29 meters per second.

(4) The test shall be conducted for a period of 90 minutes per face until all faces have been exposed.

(5) An operational check-out shall be conducted at the conclusion of the test.

b. Dust. The test unit shall be tested IAW MIL-STD-810, Method 510.3, Procedure I for blowing dust, and with the following requirements:

(1) The test unit shall be fully assembled into its operation state.

(2) The dust particle size shall be from .0001 to .01 millimeters and the concentration of 10.6 grams per cubic meter.

(3) The air velocity in the test chamber shall be 8.9 meters per second.

(4) The test shall be conducted for six hours at +23 degrees Celsius and six hours at +49 degrees Celsius, with an operational check conducted during the second test period.

(5) An operational check-out shall be conducted at the conclusion of the test.

4.5.6.8 LEAKAGE (IMMERSION)

The requirements of 3.2.5.8 shall be verified IAW MIL-STD 810, Method 512.3, Procedure I - Basic Leakage.

a. The test unit shall be fully assembled into its operation state and the following:

b. The test unit temperature shall be stabilized to 27 degrees C above the water temperature, with the water temperature at 18 ±10 degrees C.

c. The immersion depth shall be one meter and immersion period of one hour.

d. Observations for air bubbles originating from the unit shall be done.

e. After completion the test unit shall be examined for water content inside the unit. Evidence of water penetration into the test unit following the immersion test or not completing the operational check-out at the conclusion of the test shall be basis for failure.

4.5.6.9 SALT FOG

The requirements of 3.2.5.9 shall be verified IAW MIL-STD-810, Method 509.3, Procedure I for Salt Fog climatic tests, and with the following requirements:

a. The test unit shall be fully assembled into its operation state.

b. The solution concentration shall be five percent ± one percent.

c. The test unit shall be exposed for a period of 168 hours for steel substrate and 672 hours for aluminum substrate to the salt fog, followed by a 48 hours drying period.

d. An operational check-out shall be conducted at the conclusion of the test.

e. Failure criteria shall be any noticeable corrosion or blistering on the interior or exterior of the test unit, or failure to properly perform during the operational check-out at the conclusion of the test.

f. The transit case requirement of 4.5.2 shall be verified by the above test procedure or through manufacturer certification of analogous test procedures and data.

4.5.6.10 CORROSION

The requirements of 3.2.5.10 shall be verified by examination and analysis.

4.5.7 ELECTROMAGNETIC RADIATION

The Contractor shall verify the EMI requirements of each configuration described in Appendix A. The requirements of 3.3.2 shall be considered verified after successful completion of 4.5.7.1 through 4.5.7.4. Each MILES 2000 component shall operate without being a victim to site-generated or self-generated electromagnetic radiation.

4.5.7.1 CONDUCTED SUSCEPTIBILITY

The Contractor shall test the MILES 2000 components and verify IAW MIL-STD-462, Method CS101. The MILES 2000 shall not exhibit any malfunction, degradation of performance, or deviation from operational parameters when the power leads are subjected to a test signal levels as described in Section 3.3.2.1.

4.5.7.2 RADIATED EMISSIONS

The Contractor shall test the MILES 2000 components and verify IAW MIL-STD-462, Method RE102. The MILES 2000 components when operating shall be not be a source of radiated emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviations from operational parameters to adjacent operating electronic or electrical equipment as described in Section 3.3.2.2.

4.5.7.3 CONDUCTED EMISSIONS

The Contractor shall test the MILES 2000 components and verify IAW MIL-STD-462, Method CE102. The MILES 2000 components when operating shall not be a source of conducted emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviation from operational parameters to other operating electronic or electrical equipment, when connected to the same source of power or interconnected for the purpose of control or data exchange as described in Section 3.3.2.3.

4.5.7.4 RADIATED SUSCEPTIBILITY

The Contractor shall test the MILES 2000 components and verify IAW MIL-STD-462, Method RS103. The components shall not exhibit any malfunction, degradation of performance, or deviation from operational parameters when subjected to radiated levels as described in Section 3.3.2.5.

4.5.8 WORKMANSHIP

The requirement of 3.3.4 shall be verified by examination using Requirement 9 of MIL-STD-454. Random samples will be examined to verify compliance.

4.5.9 INTERCHANGEABILITY

The requirement of 3.3.5 shall be verified as prescribed by Requirement 7 of MIL-STD-454. Items performing like functions within the system shall be interchangeable.

4.5.10 SYSTEM SAFETY

The Contractor shall verify the following requirements of each configuration described in Appendix A and the requirements of 3.3.6 of this Specification. By analysis, examination, demonstration and test, the Contractor shall complete and verify compliance to the applicable items on the safety checklist provided in Appendix C. The requirements of 3.3.6 shall be considered verified after successful completion of requirements outlined in Table V along with those stated in this Section.

4.5.10.1 ELECTRICAL SAFETY

The Contractor shall verify by analysis, examination, demonstration, and test that the electrical circuitry and installation meet applicable requirements of the National Electrical Code (ANSI/NFPA 70-93) and MIL-STD-454 (Requirements 1, 8, and 27). The Contractor shall develop a list of all danger, caution, and warning signs installed in the MILES 2000 equipment and incorporated into applicable Technical Manuals (TM) and Publications. This list, which shall include design and wording of each sign IAW ANSI/NEMA Z535.3-91/Z535.4-91, shall be attached to Appendix C. The completed safety checklist-Appendix C shall be submitted and demonstrated to the Government as part of physical safety inspections of each MILES 2000 major component. The Contractor shall verify by analysis and test that the installation, operation, handling, and maintenance of batteries used with the MILES 2000 equipment does not present safety or health hazards for user personnel or damage associated equipment.

4.5.10.2 HAZARDOUS MATERIALS

The Contractor shall confirm by analysis, examination, and certification that the MILES 2000 equipment does not incorporate any asbestos or ozone-depleting substances, that glass fiber materials are not used as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel, and that PVC materials are not used in

the crew compartments. The Contractor shall demonstrate by analysis and certification that the MILES 2000 training system does not expose personnel or the environment to unacceptable levels of toxic, carcinogenic, or otherwise hazardous materials as defined by OSHA, EPA, or DOT. The Contractor shall attach to the completed Appendix C any applicable Material Safety Data Sheets along with any required warning signs on equipment and procedures/warnings in TMs and Publications.

4.5.10.3 MECHANICAL SAFETY

The Contractor shall verify by analysis, examination, demonstration, and test that any moving parts of the MILES 2000 equipment are properly guarded or provided with safety devices to prevent injury to operator and maintenance personnel, that any edges or corners are rounded and free from burrs, and that the MILES 2000 equipment's center of gravity is such that components and devices are stable and easy to handle. The Contractor shall attach to Appendix C any applicable warning signs to equipment or warnings to related TMs and publications.

4.5.10.4 PERSONNEL SAFETY

The Contractor shall verify by analysis, demonstration, examination, and test that the MILES 2000 noise generating devices do not exceed impulse and steady state noise level requirements defined in this Specification. The Contractor shall also verify by analysis, examination, demonstration, and test that the MILES 2000 equipment meets safety and health requirements of MIL-STD-1472, paragraphs 5.9.11.3, 5.9.11.5, and 5.13. The Contractor shall attach to the completed Appendix C the design and wording of warning signs installed in equipment along with warnings incorporated into TMs and publications as related to personnel safety.

4.5.10.5 IONIZING RADIATION

The Contractor shall verify by analysis, demonstration, examination, and test that, IAW Section 1020.10 of Public Law 90-602, no x-radiation equipment has an exposure rate higher than 0.5 mR per hour at a distance of five centimeters from an external point. The Contractor shall attach to the completed Appendix C the design and wording of warning signs installed in equipment along with warnings incorporated into TMs and publications as related to ionizing radiation.

4.5.10.6 LASER SAFETY

The Contractor shall verify by analysis, demonstration, examination, and test that laser equipment, system design, written TMs, and maintenance instructions meet the requirements of CFR Title 21, subchapter J, Part 1040. The Contractor shall submit an exemption to, and obtain an approval from, the Government to those requirements of 21 CFR 1040 that can not be met due to operational requirements in accordance to laser safety requirements defined in paragraph 3.3.6.6 of this Specification. IAW MIL-STD-1425 and ANSI Z136.1-1993, the Contractor shall install on the equipment applicable laser safety labels along with

incorporating applicable warnings in TMs and publications. The Contractor shall attach to the completed Appendix C the design and wording of warning labels and warnings as related to laser safety.

4.5.10.7 RADIOACTIVE MATERIAL RESTRICTIONS IN OPTICAL PRODUCTS

The Contractor shall verify by analysis, examination, and certification that the MILES 2000 equipment does not incorporate any thorium or other source materials, or other radioactive materials as defined in paragraph 3.3.6.7 of this Specification. The Contractor shall attach to the completed Appendix C any applicable Material Safety Data Sheets along with any required warning signs on equipment and procedures/warnings in the TMs and Publications.

4.5.11 TARGET VISUAL KILL STATUS OBSERVATION

The Target Visual Kill Status Indicator shall be positioned six feet above the ground. Observation for flash shall be made with at least five non-Contractor personnel positioned 1800 meters distance. At least one observer shall be a Government representative. The test shall be conducted during standard clear conditions as specified in 3.4.1.1(n). The observer shall be notified prior to each firing in order to alert them to watch for the flash. The observers shall also be notified after each flash to inform them that the flash took place, allowing for them to record their observations. Observations shall be recorded as visible or non-visible. Three out of five of the observers must record a visible observation for the flash to be deemed visible.

5 PREPARATION FOR DELIVERY

5.1 PRESERVATION AND PACKAGING

Preservation and packaging for shipment shall be IAW industry standard commercial practices and ASTM D3951-90. This requirement is also applicable to spare parts, test and support equipment, and to other support materials.

5.2 PACKING

MILES 2000 systems shall be packaged and packed in either transit cases or containers constructed to provide a compact and non-shifting load. Adequate cushioning, blocking, and bracing shall be provided to prevent damage due to shock, vibration, or to impact during shipment, handling, and storage. MILES 2000 shall be packed in containers that shall be acceptable to a common carrier.

5.3 MARKING FOR SHIPMENT

All transit cases or containers provided under this Contract shall be marked IAW MIL-STD-129.

6 NOTES

6.1 ADAPTABILITY

The MILES 2000 system shall be adaptable to weapon systems currently under development and future weapon systems for which detailed data on configuration, lethality, and other weapon/platform data is not yet available.

6.2 ABBREVIATIONS AND ACRONYMS

The following list of abbreviations and acronyms are stated in this Specification.

ABBREVIATION	TERM
AAR	After Action Review
AEL	Accessible Emission Limit
AGES	Air-To-Ground Engagement System
ATA	Air Transport Association
APSE	Ada Programming Support Environment
BIT	Built In Test
CASE	Computer Aided Software Engineering
CSCI	Computer Software Configuration Item
COTS	Commercial Off-The-Shelf
DIFCUE	Direct/Indirect Fire Cue
DPCU	Data Processing and Control Unit
DOT	Department of Transportation
DSL	Document Summary List
EPA	Environmental Protection Agency
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IAW	In Accordance With
I/O	Input/Output
LTID	Laser Target Interface Device
MGSS	Main Gun Signature Simulator
MITS	Mobile Independent Target System
MILES	Multiple Integrated Laser Engagement System
MR	Milliroentgen
MTBF	Mean Time Between Failure
MTTR	MEAN Time to Repair
NDI	Non-Developmental Item
OSHA	Occupational Health and Safety Agency
PC	Personal Computer
PID	Player Identification
Pk	Probability of kill
PQT	Product Qualification Test
PVC	Polyvinyl chloride
RETS	Remoted Target System
SAW	Squad Automatic Weapon

ABBREVIATION	TERM
SEE	Software Engineering Environment
STRICOM	Simulation, Training, and Instrumentation Command
TES	Tactical Engagement Simulation
WESS	Weapon Effects Signature Simulator

7 APPENDIX A -- MILES 2000 SYSTEM CONFIGURATIONS

7.1 MILES 2000 COMBAT VEHICLE SYSTEMS

A MILES 2000 Combat Vehicle System configuration shall be required for each of the following combat vehicles:

a. M1 Abrams series tanks. (M1A1 and M1A2 configuration)

Primary Weapons	Basic Load	Maximum Firing Rate	Effective Range	Suppression Range
120 mm				
APFSDS round	28	12 RPM	3000M	N/A
HEAT round	12	12 RPM	3000M	N/A
M240 (7.62 mm Coax)	9900	650 RPM	800M	1600M
Secondary Weapons				
M240 (7.62mm)	N/A	650 RPM	800M	1100M
M2 (12.7mm; turret type for the M1A1)	N/A	650 RPM	1000M	1800M

Manworn Quantities: 4 each

b. M2/M3 Bradley series fighting vehicles. (M2, M3, M2A1, M3A1, M2A2, M3A2 configurations)

Primary Weapons	Basic Load	Maximum Firing Rate	Effective Range	Suppression Range
M242 (25mm)				
APDS round	350	200 RPM	3000M	N/A
HEAT round	1150	200 RPM	3000M	N/A
TOW-II	15	N/A	3750M	N/A
M240 (7.62mm Coax)	2400	650 RPM	800M	1600M

Manworn Quantities: 3 each

c. M113A3 Armored Personnel Carrier

Primary Weapons	Basic Load	Maximum Firing Rate	Effective Range	Suppression Range
N/A	N/A	N/A	N/A	N/A
Secondary Weapons				
M2 (12.7 mm)	N/A	650 RPM	1000M	1800M

Manworn Quantities: 2 each

7.2 MILES 2000 INDEPENDENT TARGET SYSTEMS

A MILES 2000 Independent Target System configuration shall be required to be used with the following independent targets:

a. DELETED
b. DELETED
c. M977 - HEMTT
d. D7G - Dozer
e. FLU 419 Small Emplacement Excavator (SEE)
f. M60A1 AVLB
g. M992 - Ammunition Carrier
h. M88A1 - Recovery Vehicle
i. M728 - CEV
j. MW24C - Case
k. M1009 - CUCV ¾ Ton
l. DELETED
m. M578 - Recovery Vehicle, Light
n. Generators
o. DELETED
p. M109A6 - Howitzer, 155mm SP
q. DELETED
r. M35A2 - Truck, Cargo, 2 ½ Ton Series
s. M939A1/A2 Series - Truck, Cargo, 5 Ton Series
t. M978 - Truck, Tank Fuel Servicing
u. DELETED
v. M998A2 - HMMWV (Versions: M1097A2, M1025A2, M1035A2, M1043A2, M1045A2, M997A2, XM1109, XM113, XM114)
w. DELETED
x. Heavy fortified structures - Bunkers
y. Light Fortified Structures - Buildings, Bridges
z. M996 - TOW Carrier
aa. M9 - ACE

7.3 MILES 2000 CREW SERVED WEAPON SYSTEM

A MILES 2000 Crew Served Weapon System Configuration shall be required for the following weapon:

Weapon	Basic Load	Reload Time Delay	Effective Range
TOW	4 RNDS	30 sec	3750M

7.4 MILES 2000 INDIVIDUAL WEAPON SYSTEM

A MILES 2000 Individual Operator Weapon System configuration and associated manworn shall be required for the following weapons:

	Weapon	Maximum Firing Rate	Effective Range	Suppression Range
a.	M16A2/M4 (w&w/o M203)	650 RPM	550M	N/A
b.	M24 Sniper Rifle	15 RPM	1000M	N/A
c.	M249 SAWshort/long barrel	725 RPM	800M	N/A
d.	M2	650 RPM	1000M	1800M
e.	M240B	650 RPM	800M	1100M

7.5 MILES 2000 SURROGATE WEAPON SYSTEM

A MILES 2000 Surrogate Weapon System configuration shall be required for the following weapon:

	Weapon	Basic Load (Rounds)	Reload Time Delay	Effective Range
a.	AT4	4	N/A	300M

7.6 ALL MILES 2000 SMALL ARMS WEAPONS

The maximum quantity of blank ammunition to be expended by any of the above Individual Weapons Systems during a MILES 2000 training exercise is 400 rounds per hour.

8 APPENDIX B -- COMBAT VEHICLE/INDEPENDENT TARGET VULNERABILITY TABLES

9 APPENDIX C -- SYSTEM SAFETY DESIGN VERIFICATION CHECKLIST